The Papua and New Guinea Agricultural Journal

Vol. 9 April, 1955 No. 4

Department of Agriculture, Stock and Fisheries,
Port Moresby

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All communications should be addressed to the Editor, *The Papua and New Guinea Agricultural Journal,* Department of Agriculture, Stock and Fisheries, Port Moresby.

SUBSCRIPTION RATES

Commencing with Volume 9, No. 1, *The Papua and New Guinea Agricultural Journal* will be the title for the former publication *Papua and New Guinea Agricultural Gazette.* The publication will still follow the form of the pre-war *New Guinea Agricultural Gazette* and will deal with recent advancement in tropical agriculture and act as an extension medium for the dissemination of agricultural information to the Territory planting and farming community.

Members of the public are invited to submit items of tropical and general interest to agriculturalists in the Territory. Articles from interested persons outside the Territory will be appreciated.

The Annual Subscription payable in advance will be 1s. 6d. postage paid for each issue or 6s. per annum for four issues.

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The
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Agricultural Journal

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CONTENTS

FORMER ISSUES OF *GAZETTE*

The following numbers of the *Agricultural Gazette* have been issued :

New Guinea Agricultural Gazette—

Volume 1, Number 1.
Volume 2, Numbers 1, 2 and 3.
Volume 3, Numbers 1 and 2.
Volume 4, Numbers 1, 2, 3 and 4.
Volume 5, Numbers 1, 2 and 3.
Volume 6, Numbers 1, 2 and 3.
Volume 7, Numbers 1, 2, 3 and 4.

The Papua and New Guinea Agricultural Gazette—

Volume 8, Numbers 1, 2, 3 and 4.

The Papua and New Guinea Agricultural Journal—

Volume 9, Numbers 1, 2 and 3.

Copies of all numbers of the *Gazette* to Volume 7, No. 4, are out of print.

The Papua and New Guinea

Agricultural Journal

Vol. 9 April, 1955 No. 4

NOTES ON THE SUBMISSION OF SPECIMENS FOR VETERINARY LABORATORY EXAMINATION

R. J. Olds, B.V.Sc.*

THE basis of diagnosis is accurate reporting and the collection of good and satisfactory specimens to enable adequate and detailed laboratory investigations to be made.

The purpose of these notes is to act as a guide to Field Officers and stock owners as to what information and what specimens are required. Any diagnosis can be only as good as the information and specimens which are supplied permit it to be. It is desired to stress that these notes are not designed to serve as an index of diagnoses.

Climatic conditions in this Territory cause deterioration of animal tissues in a comparatively short time, and it is most important, therefore, that all specimens should be collected under conditions which as closely approximate the ideal as possible, and the purpose of these notes is to indicate the method in which specimens should be taken, and to indicate those symptoms and signs which are important in diagnosing any condition affecting livestock.

An index and a glossary of terms not commonly met with are provided.

There will doubtless be sections of these notes which will require further explanation, and Field Officers and stock owners are invited to submit queries to the Chief of Division of Animal Industry on any point in the notes upon which they require further detailed information.

These notes are very detailed and to assist in their use the following reference list of section numbers is given :—

1. How to use these notes.
2. Advice to be forwarded with all specimens.
3. Examination of sick animal.
4. Examination of dead animal.
5. Keeping specimens cool.
6. Blood collection.
7. Blood smears.
8. Smears from tissues and organs.
9. Smears of pus, exudates, urine and other fluids.
10. Pipette collection.
11. Milk collection.
12. Tissues for histological examination.
13. Limb bone for bacteriological examination.
14. Plant specimens.
15. Cleaning and sterilization of equipment.

Specimens and advice required for diagnosis of various conditions.

16. Abscesses.
17. Abortions and stillbirths.
18. Anaemia.

* Pathologist-Bacteriologist, Division of Animal Industry.

1. HOW TO USE THESE NOTES.

Cross reference numbers throughout these notes refer to section numbers NOT page numbers.

If unfamiliar with technical terms refer to the Glossary, Section 57. Terms included in the glossary are printed in *italics* in the text.

The commoner techniques required will be found in Sections 3 to 15. For persons unfamiliar with these techniques, they are cross referenced from the text. After some practice it will be unnecessary to cross refer constantly to these techniques.

Always observe the following routine in submitting specimens :—

A. (*a*) *If specimens are to be submitted from a live animal* :—

Examine the animal as in Section 3.
Look up the symptoms in the index (58).

The required specimens and advice for a laboratory investigation of the conditions will be found in the section referred in the index.

If a number of symptoms is obvious, make sure that the specimens submitted cover all symptoms shown.

(*b*) *If specimens are to be submitted from a dead animal.*—

Examine the carcass as in Section 4.
If the animal died suddenly, see Section 50.

If any symptoms were observed before death, take appropriate specimens for those symptoms (see index), as well as appropriate specimens from any organ showing abnormalities at post-mortem examination (organs may be found in Index 58).

If in doubt whether an organ is abnormal include specimens for a laboratory decision.

Remember, however, that the specimens will usually be altered by the time they reach the laboratory, and a complete description of how they appeared at post-mortem examination is most helpful.

B. *Label all specimens as soon as they are prepared.*

The label should indicate :—

The organ from which the specimen was taken.

Identification of the animal (if specimens are being submitted from a number of animals).

Preservative used (if any).

C. Duplicate any specimens that may have been spoilt during collection. This applies particularly to pipettes or sterile bottles that may have been contaminated, pipettes that have failed to seal properly and smears that may be too thick.

D. *Include a covering note with the specimens.*

This note should include :—

(*a*) All details requested in Section 2.

(*b*) All other advice requested for the particular set of specimens.

(*c*) All notes made during your examination of the sick animal (3)

and/or your examination of the dead animal (4).

Try to describe findings accurately rather than attempt to interpret them, e.g. "The membranes of the mouth were pale" rather than "The animal was anaemic".

E. Keep unpreserved specimens as cool as possible until they reach the laboratory (see Section 5).

F. Pack specimens securely. Wood waste, sawdust, cotton wool, or a liberal quantity of crumpled paper are suitable packing materials. Use strong cartons or boxes. Live animals should be forwarded in strong crates and should be given sufficient water to last the journey or arrangements should be made for their care *en route*. Animals submitted alive will normally be destroyed at the laboratory for complete pathological examination. The crates also will usually be destroyed.

G. Send packed specimens to :—

Veterinary Laboratory,
Department of Agriculture,
PORT MORESBY,

and clearly mark the parcel,

"PATHOLOGICAL SPECIMENS—URGENT".

H. Wherever possible, forward specimens by air and send a covering radiogram to :—

Veterinary Laboratory, phone 5360, Port Moresby.

The following example is the best type of radiogram to send :—

"SPECIMENS FORWARDED
QANTAS 11am SIXTEENTH
SMITH RABAUL".

Note that this radiogram indicated—

the name of the air company,
the time the plane was due to leave with specimens,
the day of the month the plane was due; and
sender's name and location.

From these details we can arrange prompt delivery of the specimens to the laboratory at this end.

If you feel that the text is not sufficiently explanatory, or that your knowledge is insufficient for the collection of certain specimens, or that you cannot collect specimens from certain animals without undue risk, contact the laboratory for special directions, stating the circumstances of the case.

2. ADVICE TO BE FORWARDED WITH ALL SPECIMENS.*

With any specimens forwarded to the laboratory, it is important that an adequate history be supplied. The laboratory worker must judge from this advice what tests are to be applied to the specimens. Laboratory tests are time consuming and it cannot be expected that extensive testing will be undertaken unless warranted by the history and quality of the specimens. Specimens received without any covering advice will be held until advice is received. To avoid disappointment include a covering note with the specimens, supplying the following information :—

(*a*) Owner's name and address in full (for recording purposes).

(*b*) Description of the animal(s). Species, colour, breed, sex and age, e.g. red and white crossbred cows, four years old.

(*c*) Condition of the affected animal—whether prime, good condition, poor, pregnant, etc.

(*d*) Number of animals in the herd or flock.

(*e*) Number of animals affected by the condition to be investigated showing similar symptoms.

(*f*) Number of animals dead from the condition.

(*g*) Number of animals recovered from the condition.

(*h*) Details of the ration, or description of pasture the animals have been eating.

(*i*) Whether the animals have recently been moved to a new property or new pastures or are travelling at the time of illness.

(*j*) Possibility of contact with other animals.

(*k*) Symptoms shown by affected animals should be decribed as accurately as possible. Sick animals should be examined as in Section 3 and all findings recorded.

* A book of specimen advice notes suitable for reporting the above details will be supplied by the laboratory on request

(*l*) If the animal was submitted to a post-mortem examination—whether the animal died, or was killed for post-mortem examination. All post-mortem findings (see Section 4).

(*m*) If any treatment was attempted. Give details.

(*n*) Whether similar cases have previously been known on the property, or in the area.

(*o*) Other special points which should be noted are mentioned under the headings of the specimens concerned.

(*p*) List of specimens submitted.

(*q*) Date and time of day specimens collected.

3. EXAMINATION OF SICK ANIMAL.

Make notes while examining the animal. Note each of the following points briefly and clearly :—

(*a*) *Main symptom (or symptoms)*, i.e. the main points that made you decide that the animal was sick (e.g. will not eat, cannot stand, lame in right fore-legs, etc.).

(*b*) How long the animal has been ill.

(*c*) *Posture.* What is the position of the sick animal? Standing normally, standing with head down, lying with legs outstretched, ears drooped, or any other peculiarity of posture.

(*d*) *Alertness.* Does the animal show normal interest in its surroundings, or is it dull or disinterested, or apt to charge onlookers.

(*e*) *Condition* of affected animal as compared with the rest of the herd.

(*f*) *Appetite and thirst.* Whether the animal eating and drinking normally, eating unnatural foodstuffs (e.g. bone chewing in cattle). Does it swallow normally?

(*g*) *Temperature.* This is taken with an ordinary clinical thermometer inserted three parts into the rectum, left there for two minutes, and then removed and read. Make sure that the mercury is shaken back before inserting the thermometer. State whether the animal was in direct sunlight or shade or whether exercised, driven or mustered, before temperature was taken.

(*h*) *Respiration (breathing).*—This is usually best viewed by standing at the back of the animal and watching the movements of the ribs. Note whether normal or abnormal. If abnormal whether shallow, deep, irregular (jerky) and count the number of breaths per minute.

(*i*) *Condition of the bowels.* Has the animal passed *faeces* recently? If so, what type of *faeces* (e.g. hard, soft, blood-stained, dark)? Does the animal strain to pass *faeces*? Any signs of *scour* (soiling the buttocks).

(*j*) *Urine.* Is the act of urination normal, accompanied by straining or apparently uncontrolled? Is the urine normal in colour, appearance and odour?

(*k*) *Discharges.* Are there any discharges from one or both nostrils or eyes, or from the mouth, *rectum*, *vagina* or *prepuce*.

(*l*) *Condition of membranes.* Examine the membranes lining the eyelid, nostril and lips and note whether they are normal, pale or dark red.

(*m*) *Coat and skin.* Is the hair of normal colour and lustre? Note the position and nature of any wounds, swellings or external parasites.

(*n*) In milking females, is the milk flow normal, diminished, milk abnormal?

(*o*) Any other relevant information.

4. EXAMINATION OF DEAD ANIMAL.

The technique is best learnt by demonstration. The following notes are given in considerable detail to serve as a guide to persons wishing to practise the technique.

The following points should be borne in mind :

The post-mortem examination should be carried out as soon after death as possible.

If the animal is observed ill before death, give a full history.

Make notes while doing post-mortem examination—it is unwise to commit details to memory.

It is desirable to have someone to take notes and attend to the labelling of specimens. Label specimens as soon as they are taken. Make a list of specimens as they are taken and include this list with the specimens submitted to the laboratory.

Avoid contamination of specimens, especially specimens for bacteriological examination, with dust, gut content, etc. Wherever possible place aside on a tray or clean paper, organs from which pipettes or smears are to be obtained and take these specimens later inside a building.

It is a good general rule to wear rubber gloves and suitable protective clothing which can be disinfected after the operation.

Keep a bucket of disinfectant handy.

If Anthrax in likely from the history of the animal or property, proceed as in 19. If Anthrax is unlikely, carry out a post-mortem examination as follows, and submit specimens from any abnormal organs.

Before opening the carcass :—

Assemble the following equipment at the site of post-mortem examination—

gambrel,
knives,
steel,
pair of scissors,
pair of tissue forceps,
pair of bone forceps,
pipettes,
grease pencil or labels and lead pencil,
rubber gloves,
saw,
note paper,
small knife or scapel,
spatula or old knife,
spirit lamp or blow-lamp,
several clean jars,
several sterile jars,
10 per cent. formalin,
glass slides,
length of string or four pairs of pedicle clamps
wire loop, if available, and
bucket of disinfectant.

Note the position of the body and examine the ground for evidence of struggling as an indication of violent death.

Examine nearby pastures, rubbish dumps, store-houses, etc., for any evidence of the animal having eaten poisonous plants or chemicals.

If the time of death is known, note the time elapsing between death and post-mortem examination. If the time of death is unknown, some idea may be gained from examination of the following :—

Rigor mortis—best tested in the limbs and jaws.

Bloat of the abdomen and protrusion of the rectum from abdominal pressure.

Flabbiness of the cornea. (This is normally tense in a recently dead animal.)

Putrefaction—discolouration, odour and gas in the tissues.

Note presence and extent of any of these changes.

Examine the nose, mouth, ears, eyes, *anus*, *vulva* or *prepuce*, skin and navel in young animals. Record the presence of discharges, discolouration, wounds, swellings and skin diseases or parasites and collect appropriate specimens.

OPENING THE CARCASS.

(A) *Without a gambrel.*—

If a gambrel is not available, a similar routine to that given below may be followed with the animal lying on the ground on its back. This has the disadvantage that the abdominal organs tend to fall back into the abdominal cavity rather than out as they do in the suspended position. Greater care must therefore be taken to prevent contamination of the abdominal organs with gut content and dirt. This may be overcome to some extent by lying the animal on the left side. The advantages of less risk of contamination of specimens, ease of following a definite routine, and comfort to the operator will often make it worthwhile

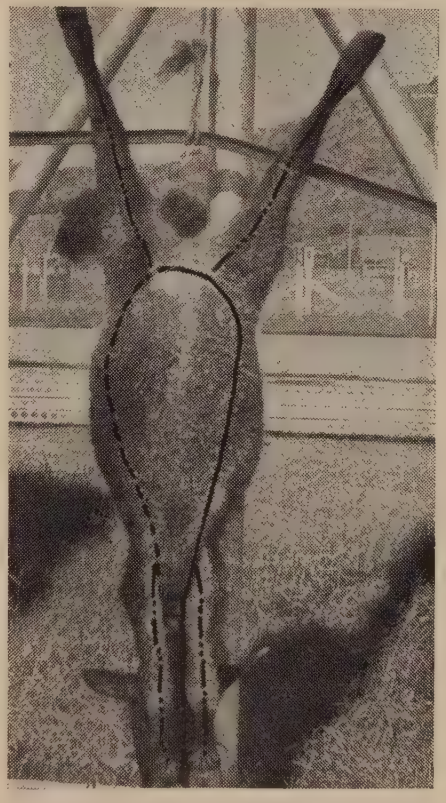

Fig. 1.—A heifer suspended on an improvised gambrel ready for post-mortem examination.
—— Incision 1. — — Incision 2. — . . — Incision 5.

improvising a *gambrel* or devising some other means of suspending the carcass by the hind legs.

Fig. 2.—Incision 1 has been made through the skin commencing behind the udder and finishing at the point of the lower jaw bone.

(B) *With a gambrel.*—

Suspend the animal on the *gambrel.*

Make Incision 1 (Figs. 1 and 2) through the skin commencing behind the udder or *scrotum* and finishing at the point of the lower jaw bone.

If the blood vessels of the fore limbs are cut while making Incisions 1 and 2, some of the blood should be collected in a sterile bottle.

Examine the *supramammary* or *scrotal lymph nodes.**

Examine the udder or *scrotum* and *penis.*

Examine the right *precrural lymph node.*

Examine the right *prescapular lymph node.*

Make Incision 2 (Figs. 1 and 3) on the left side.

Examine the left precrural lymph node.

Examine the left *prescapular lymph node.*

Remove the area of skin between Incisions 1 and 2 (Fig. 4).

Examine the *subcutaneous* tissue in the area so exposed.

If a blood sample has not yet been collected one may now be obtained by opening the exposed *jugular veins* at F (Fig. 4).

Examine the *thyroid gland.*

Make Incisions 3 and 4 (Fig. 4) through the muscle wall into the abdominal cavity. Allow the flap of muscle tissue to fall forward out of the abdominal cavity.

Fig. 3.—Incision 2 has been completed.

Press the *rumen* (Fig. 5) to the right side and look for any *peritoneal* fluid in the concavity of the *diaphragm.*

Note the presence or absence of gas in the intestines.

* For assistance in location of lymph nodes see Table 1. Although the examination of lymph nodes is frequently omitted by stock owners, they may yield important information and it is recommended that persons using these notes try to familiarize themselves with their location and examination.

Figure 4.—The area of skin between Incisions 1 and 2 has been removed.

—.—.— Incision 3. ..... Incision 4.

A. Location of supramammary lymph nodes (scrotal in male).
B. Location of right precrural lymph node.
C. Location of left precrural lymph node.
D. Location of right prescapular lymph node.
E. Location of left prescapular lymph node.
F. Location of exposed left jugular vein.

Examine the *peritoneum.*

Examine the *spleen* (Fig. 5) which is now exposed on the left side of the *rumen* or stomach.

Examine the urinary bladder (Fig. 5).

Place a string ligature or large pair of artery forceps around the neck of the bladder and cut above the ligature. Remove the urinary bladder and examine the interior.

Examine the internal reproductive organs. It may be necessary to remove the *uterus* of a pregnant female to allow easy access to the rest of the abdominal organs.

Place two string ligatures or artery forceps about one inch apart around the terminal part of the large bowel at L (Fig. 5). This prevents gut content running over the abdominal organs when the bowel is cut. *Faeces* should be squeezed back behind the forceps before cutting.

Cut the large bowel at L (Fig. 5) and dissect the attachments of the gut from the area of the backbone. Allow the gut to hang outside the abdominal cavity.

Examine the *pancreas.*

Examine the kidneys (Fig. 5) and *adrenals.*

Assist the *rumen* and *fore stomachs* (or stomach) over the edge of the last pair of ribs. This will stretch the *oesophagus.*

Place two pairs of artery forceps on the *oesophagus* close to the *rumen* or stomach.

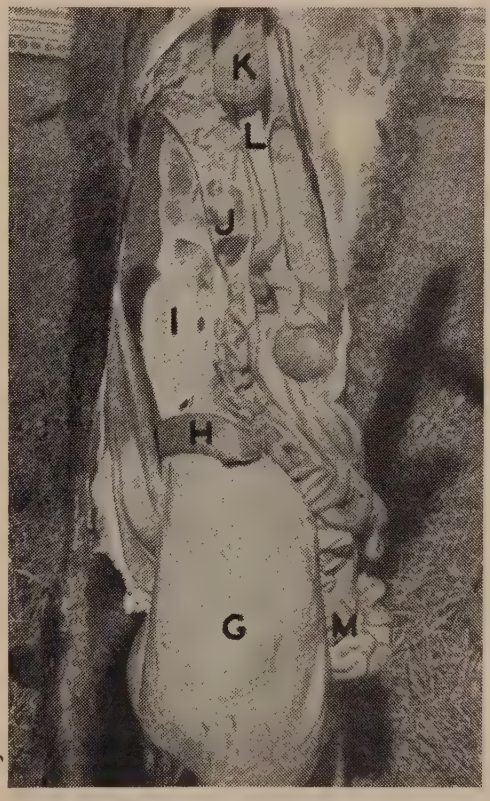

Fig. 5.—Incisions 3 and 4 have been made and the rumen and small intestines have been allowed to hang out of the abdominal cavity.

G. Rumen.
H. Spleen.
I. Diaphragm.
J. Left kidney.
K. Urinary bladder.
L. Large intestine showing location of ligatures.
M. Small intestine.

Cut between the two forceps and the gut will fall out on to the ground. It can be examined later.

Examine the liver and gall bladder and remove for further examination. Trace the branches of the bile duct into the liver.

Examine the *abdominal lymph nodes* situated along the course of the backbone.

Examine the *diaphragm* (Fig. 5).

Remove the *diaphragm* by cutting close to the chest wall.

Look into the chest cavity for any fluid at the bottom or *adhesions* to the wall. If present collect fluid in pipettes.

Examine the *mediastinal lymph node* in the tissue attaching the lungs to the backbone.

Detach the tongue, *oesophagus* and *trachea* by deepening Incisions 1 and 2 down to the bony structures. Start from the point of the lower jaw, freeing the tongue first and working back to the first pair of ribs.

Examine the *retropharyngeal lymph nodes* as the tongue is removed (Figs. 6 and 7).

Remove the muscles overlying the *trachea* at the front end of the breastbone.

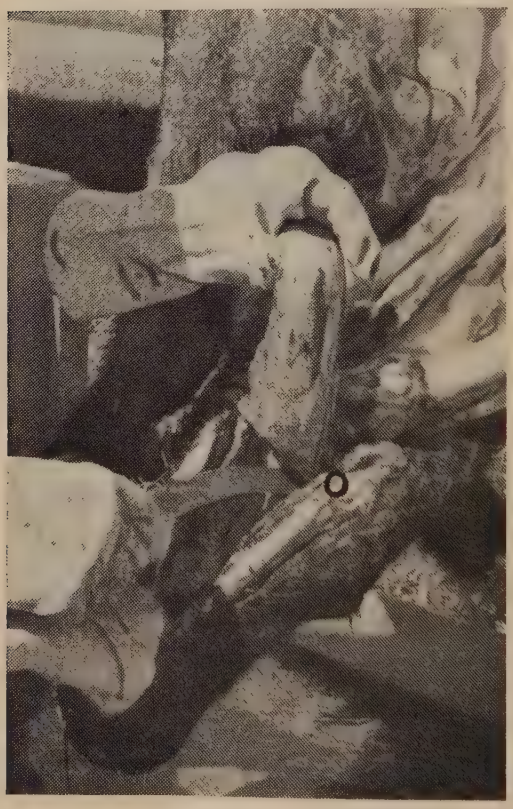

Fig 6.—Removal of tongue, oesophagus and trachea. The tongue has been freed.
O. Location of the right submaxillary lymph node.

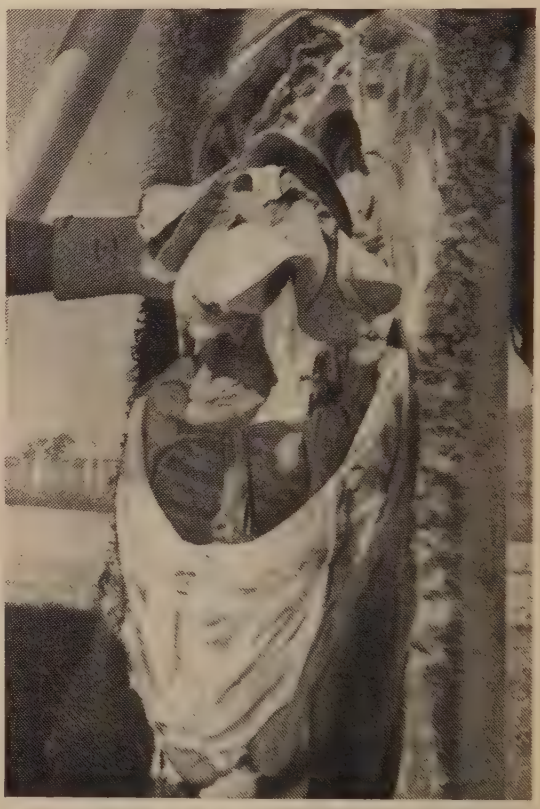

Fig. 7.—A further stage in the removal of the tongue, oesophagus and trachea. The tongue, oesophagus and trachea have been freed.

Break down the tissues enclosing the space between the first pair of ribs. Break down the attachments of the lungs and heart to the backbone and breastbone.

The entire lungs, heart, *trachea, oesophagus* and tongue may now be lifted out in one piece by drawing the *trachea, oesophagus* and tongue up through the space between the first pair of ribs (Fig. 8).

Examine the heart sac and collect excess fluid in a pipette before opening.

Open the heart sac and examine the heart.

Open the *oesophagus* and examine the interior.

Examine the lungs—feel for any abnormal areas.

Commencing at the *larynx* open the *trachea* with a pair of scissors and examine the interior.

Fig. 8.—Removal of the lungs, heart, trachea, oesophagus and tongue in one piece.
N. Location of the retropharyngeal lymph nodes.

Continuing with scissors trace the branches of the *trachea* into the lungs (Fig. 9).

Examine the *bronchial lymph nodes* at either side of the main branches of the *trachea.*

Dissect out a few ribs and test their strength. Note whether they bend or snap.

Expose the joint between the skull and first vertebra by dissecting away the overlying muscles leaving the membrane intact. Sear the membrane with a hot spatula and pierce with a pipette. Withdraw *cerebrospinal* fluid.

If the cord is to be examined remove as in Section 40. This will normally be necessary only in animals that have shown complete or partial paralysis of the hindquarters.

Bend the head backwards and dissect the head from the first vertebra.

Examine the exposed *oral cavity* and the *submaxillary* and *parotid lymph nodes.*

Place the head on the cut surface with the nose pointing upwards.

Open the nasal cavity by cutting back from the nostrils as far as possible, with a knife and continue the incision with bone forceps. Carry the incision laterally in front of the eyes. This step is facilitated by removing the overlying skin first.

Break the bony wall to expose the nasal cavity. Carry back with bone forceps and examine the *sinuses.*

If the animal has shown nervous symptoms remove and examine the brain as in Section 38 (Fig. 10).

Returning to the suspended carcass, make Incisions 5, 5, 5, 5 (Fig. 1).

Remove the fore limbs and examine the fetlock, knee, elbow and shoulder joints of each fore limb.

Examine the *popliteal lymph nodes.*

Examine the hock, fetlock, hip and stifle joints of each hind limb.

Clean up limb bones for bacteriological examination if required.

Examine the *mesenteric lymph nodes* and gut which has previously been placed aside. The gut should be run out to its full length, if necessary dissecting off the attached mesentery with a pair of scissors. The further examination of the gut will depend on the following :—

(*a*) If a laboratory examination for parasites is required treat as in Section 42.

Fig. 9.—Opening the branches of the trachea in the lungs.
P. Location of mediastinal lymph nodes.
Q. Location of left bronchial lymph node.

(*b*) If poisoning is suspected treat as in Section 43.

(*c*) If the animal has shown diarrhoea or other signs of *gastrointestinal* disorder treat as in Section 49.

(*d*) If the animal died suddenly treat as in Section 50

(*e*) If the animal died in an emaciated condition following a chronic illness treat as in Section 44 (*a*).

(*f*) If the animal died in an emaciated condition following acute illness treat as in Section 44 (*b*).

(*g*) Otherwise open each section separately and examine the interior in the following order—

abomasum (or stomach), small intestine, large intestine, *fore stomachs* (in ruminants).

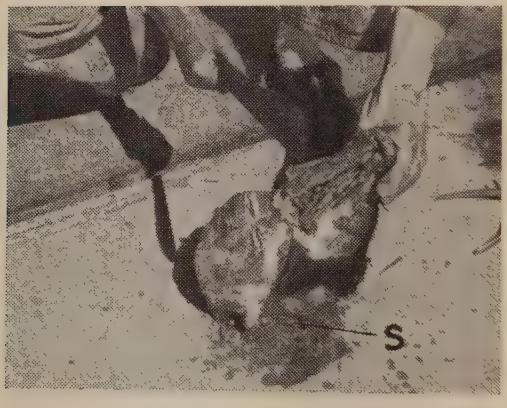

Fig. 10.—Opening the skull with a bush knife to expose the brain.
S. Location of the right parotid lymph node.

Having completed the post-mortem examination, disinfect the gambrel by flaming the contaminated parts with the painter's blow lamp or by washing with the bucket of disinfectant. Other instruments and clothing should be sterilized by boiling.

5. KEEPING SPECIMENS COOL.

Unpreserved specimens should be kept as cool as possible until they reach the laboratory. If it is necessary to hold specimens in a refrigerator holding household foodstuffs, the following precautions should be observed :—

(*a*) *Specimens in formalin.* Do not place in refrigerator as formalin taints food and in any case, these do not require refrigeration.

(*b*) *Smears* of blood, fluids or organs, should not be refrigerated.

(*c*) *Pipettes.* After sealing wrap in clean paper.

(*d*) *Screw cap bottles* may be treated as for pipettes.

(*e*) Where only a small parcel of specimens is to be forwarded, these may be packed in a metal container which is then completely sealed by soldering. The outside of the metal container can then be disinfected and then placed in the freezing compartment.

If using a thermos flask for transport of specimens, place cotton wool pad in bottom of thermos and place specimens and opened thermos in refrigerator. When cold and ready to forward, place specimens in pipettes or small sterile bottles in thermos, well protected by cotton wool. Top up thermos with crushed ice. Thermos should be well packed in straw, etc., for transport.

6. BLOOD COLLECTION.

Blood samples should never be handled roughly and should be kept in the shade and as cool as possible.

A. *Technique.*—

Horses and cattle. Bleeding is best done from the *jugular vein.* Restrain the animal to prevent excessive movement of the head. A cow's head may be fixed in a bail, other cattle should have their horns and halter rope tied as close as possible to a rail which is slightly above their normal head level; horses should be firmly held by a halter and a twitch applied if necessary.

The hair over the bleeding site is clipped and shaved and the skin cleaned with methylated spirit.

If a beef animal is to be bled it is best to raise the vein by looping a stout piece of rope around the base of the neck and tightening it. Pressure from the thumb and forefinger is suitable with smaller animals and with thin skinned horses and dairy cows.

Without a syringe. Gauge 14 needles about three inches long are suitable for this method. They may be washed out with

TABLE 1.

To assist in the location and examination of *Lymph Nodes.**

Name of Lymph Nodes.	Stage when examined in Post-mortem examination.	Location (in the standing position, and size).†	Illustration On.
Supramammary (of female)	After making Incision 1	Above the hind part of the udder	A (Fig. 4).
Scrotal (of male)	After making Incision 1	In the fat, above and behind the scrotum	B, C (Fig. 4).
Precrural	Right—after making Incision 1 Left—after making Incision 2	In the fat of the flank. About 3 to 4 in. in length	D, E (Fig. 4).
Prescapular †	Right—after making Incision 1 Left—after making Incision 2	A handbreadth above and in front of the point of the shoulder. About 4 inches long	
Abdominal ‡	After removing the abdominal organs	Along either side of the vertebral column	
Mediastinal	After opening the thoracic cavity	In the tissues attaching the lungs to the backbone. Single in some animals; multiple in others	P (Fig. 9).
Retropharyngeal	While removing the tongue, oesophagus and trachea	In the throat, behind the oral cavity and above the commencement of the oesophagus. About 3 inches long	N (Fig. 8).
Bronchials	Before examining the lungs	On either side of the trachea, on its two main branches	Q (Fig. 9).
Sub-maxillarys	After removal of the head	One near each angle of the lower jaw bone on the inner surface. About 1½ inches long	O (Fig. 6).
Parotids	After removal of the head	A little below and slightly in front of the base of the ear. About 3½ inches long	S (Fig. 10).
Popliteals	Before opening the joints of the hind limbs	Embedded in fat between the muscles on the rear surface of the hind leg approximately at the level of the stifle. About 1½ inches long	
Mesenterics	Before examining the gut	A chain of nodes in the tissues attaching the gut to the backbone, running roughly parallel to the intestine	

* Other Lymph Nodes of the body which are somewhat more difficult to locate have been omitted from these notes.

† Measurements given in this table apply to full grown cattle. The nodes are generally correspondingly smaller in smaller animals. They may be greatly swollen in certain diseased conditions.

‡ Used here as a general term to include the internal and external iliac, lumbar and renal lymph nodes.

water or normal saline between bleedings but before the sample is taken enough blood must be allowed to flow through the needle to flush out the water.

Grip the needle firmly and thrust it into the vein with the point directed towards the animal's head. The needle should be held at an angle of about 20 degrees to the skin.

Allow the first few drops of blood to fall to the ground.

Collect about three-quarters of a bottle, taking care to prevent dust, hair or water contaminating the sample.

With a syringe. Gauge 18 to 20 needles are suitable.

After collection the blood should be transferred to a collecting bottle avoiding a violent squirting, as this causes frothing, red cell break down and partial clotting.

Sheep and goats. The technique is the same as that used with horses or cattle. The animal may be bled in a standing position or by holding it upright on the rump with the fore legs off the ground between the legs of an assistant.

Pigs. Pass a loop of rope around the upper jaw behind the tusks and tie the rope to a firm post. The pig will strain back against the rope and stand fairly still.

Clean the base of the tail with methylated spirits.

With a sharp scalpel cut the blood vessels on the under surface of the tail so that the blood flows in quick drips.

Collect the blood directly into a bottle. If the blood flow is too slow deepen the incision or make a new one rather than attempt to hasten the flow by squeezing.

If necessary apply a ligature of string to the base of the tail to arrest bleeding.

Pigs may also be bled from a vein in the ear.

B. *Citrated Blood.*—

Without a syringe. Collect as above into specially prepared bottle containing *sodium citrate* as supplied by the laboratory.

During collection shake the bottle with a rotary motion to ensure mixing of the citrate. Excessive or violent shaking is undesirable.

With a syringe. Draw 2 c.c. of *sodium citrate* solution into a 20 c.c. syringe before inserting the needle into the vein.

Withdraw blood to the 20 c.c. mark.

Remove the syringe and needle from the vein and invert to mix the citrate with the blood.

Transfer the blood to a collecting bottle, avoiding violent squirting.

C. *Serum.*—

Without a syringe. Bleed as above into a bottle *without* sodium citrate.

Allow the blood to stand overnight when a clot will have formed and contracted, leaving *serum* separated from the clot.

Carefully pour the *serum* off into another bottle which is to be forwarded to the laboratory.

Cattle, sheep or goat blood may be left 36 hours or longer, in a cool place without ill effect. Pig blood, however, must have the serum poured off as soon as it has separated (four to twelve hours is the usual time taken).

If bleeding several animals and forwarding *serum* without first removing it from the clot, ensure that the blood samples have sufficient time to clot before transporting them.

With a syringe. Not recommended unless the operation can be performed quickly to avoid clotting of the blood in the syringe.

7. BLOOD SMEARS.

For microscopical examination, blood smears should be very thin and should be made immediately the blood oozes from the needle prick. If the blood has commenced to clot it is impossible to make a good smear. A very small amount of blood is all that is required and it should be very well spread. The best needle for the operation is a straight surgical suture needle with a cutting edge, which can conveniently be held in a cork.

Technique.—

Clip and shave the hair on the upper surface of the ear; and clean the ear with methylated spirits. Care must be taken to allow the spirit to dry before continuing.

Place a clean specimen slide on a firm horizontal surface.

BLEEDING A STEER FROM THE JUGULAR VEIN.

Fig. 11.—A. The animal is restrained to prevent excessive movement of the head.

Fig. 12.—B. Needle is thrust into vein, which is raised by tightening strap around base of neck.

Fig. 13.—C. The blood is collected in a bottle.

PREPARATION OF A BLOOD SMEAR FROM THE EAR VEIN OF A STEER.

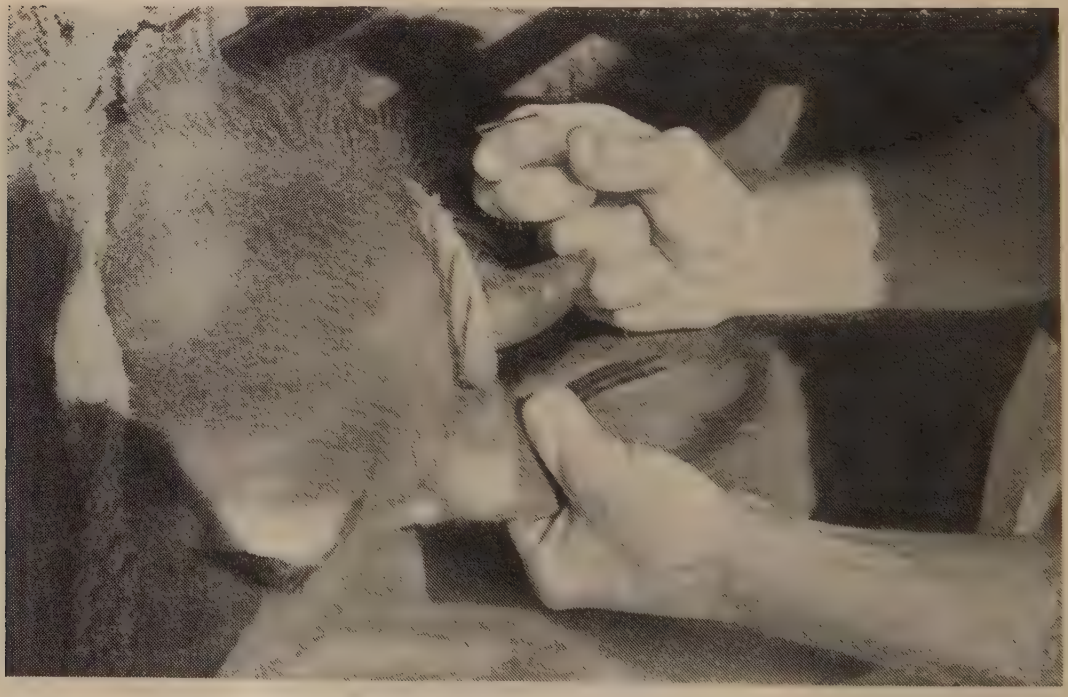

Fig. 14.—A. After shaving and cleaning the area the vein on upper surface of ear is raised by pressure with thumb on part of vein nearest the base of ear. The needle held in a cork is plunged into raised vein.

Fig. 15.—B. A small drop of blood is taken up on the edge of the spreader slide.

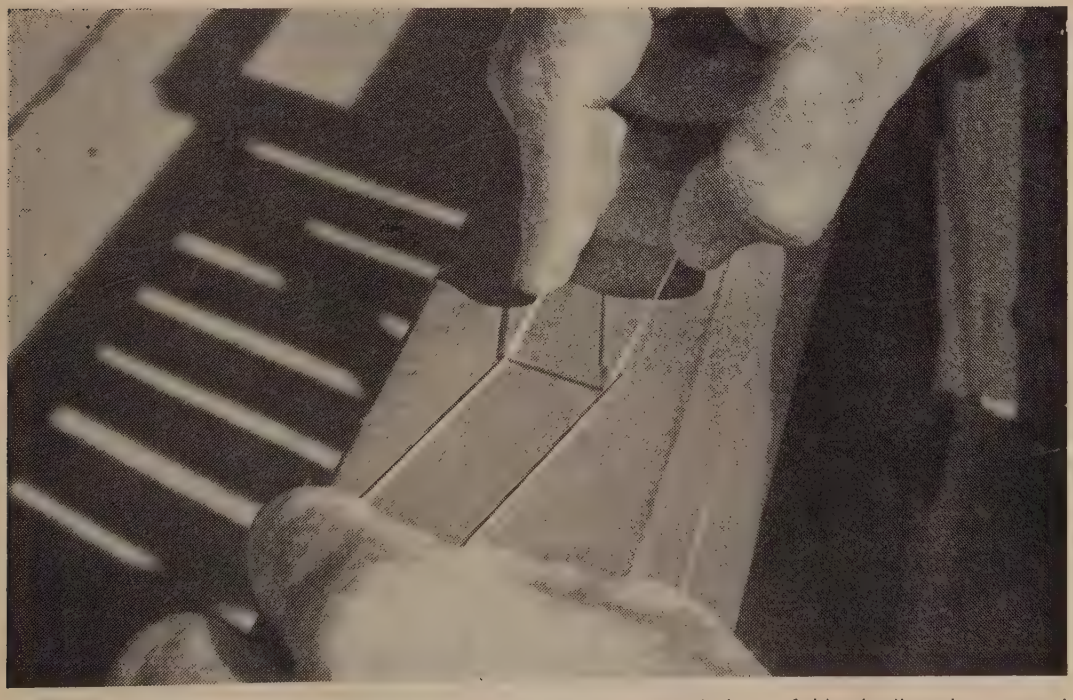

Fig. 16.—C. Edge of spreader slide is applied to specimen slide and drop of blood allowed to spread along contact edge. The smear is formed by pushing edge of spreader slide along specimen slide.

Raise a vein on the upper surface of the ear by pressure with the thumb on the part of the vein nearest the base of the ear.

Plunge the needle sharply into the raised vein and the blood will exude.

Touch the drop of exuding blood with the edge of a second slide which is to be used as a spreader.

Flick the excess blood off the spreader slide and transfer a *small* drop to the specimen slide which has previously been placed on the horizontal surface.

Wipe excess blood off the spreader slide with a clean, dry cloth, if necessary.

Apply the spreader slide to the specimen slide at an angle of about 30 degrees.

Allow the drop of blood to spread along the whole width of the contact edge.

Push the spreader along to the other end of the specimen slide with one even movement, so that the drop of blood is pulled along behind the spreader.

Allow the smear to dry in the shade, protected from flies, dust or moisture.

Label " Ear Blood ".

Wrap individually in paper and pack in cotton wool.

8. SMEARS FROM TISSUES AND ORGANS.

Cut the tissue or organ with a sharp, clean knife.

Touch the freshly exposed surface with the edge of a spreader slide, and smear the material on to clean slides as for blood smears (7). These smears should be thin and labelled clearly with the name of the organ.

Allow to dry, protected from direct sunlight, flies, dust and rain, before packing.

Pack as for blood smears (7).

9. SMEARS OF PUS, EXUDATES, URINE OR OTHER FLUIDS.

Ordinary newsprint should be legible through a good thin smear, if the slide is placed in contact with the newspaper.

Thin smears of these fluids may be made by either :—

(*a*) Smearing the fluid with a spreader slide as for blood smears ; or

(*b*) Taking up some of the fluid with a wire loop, point of a clean knife or end of a clean match-stick and spreading into a thin film on the slide. If pus is too thick, it may be thinned out with clean water until a thin film is formed.

Label clearly and allow to dry, protected from direct sunlight, flies, dust and rain, before packing.

Pack as for blood smears (7).

10. PIPETTE COLLECTION.

These pipettes are supplied sterile by the laboratory. They can be sealed off after samples are taken, and require only a very small space for transport. The sending of unsealed pipettes, pipettes plugged with sealing wax, or pipettes likely to be broken in transit, is to a large extent a waste of time, since contamination from outside makes them useless for examination. Material should be taken as soon as possible after death. The operation is best carried out inside a building rather than outside in the wind.

Technique.—

Attach a rubber teat to the cotton plugged end. Gently break the point at the fine end of the pipette with a pair of forceps.

Pass the end of the pipette through a flame three or four times to destroy contamination on the outside of the glass. Avoid resealing the tip.

Meanwhile, a spatula has been heated in the flame. Sear the surface of the organ with the hot spatula.

Insert the fine end of the pipette into the organ where it has been seared.

Break down the tissue in the neighbourhood of the puncture by manipulation of the pipette applying constant suction with the rubber bulb to draw the tissue for an inch or more into the pipette.

Withdraw the pipette.

Draw the tissue further into the barrel by suction, or by inverting the pipette and tapping the wide end on to some solid object.

Seal the pipette by placing the fine end into the flame. As soon as the glass turns cherry red and softens, draw out the tip with a pair of forceps. *Avoid cooking the tissue during this step* by using a hot flame which

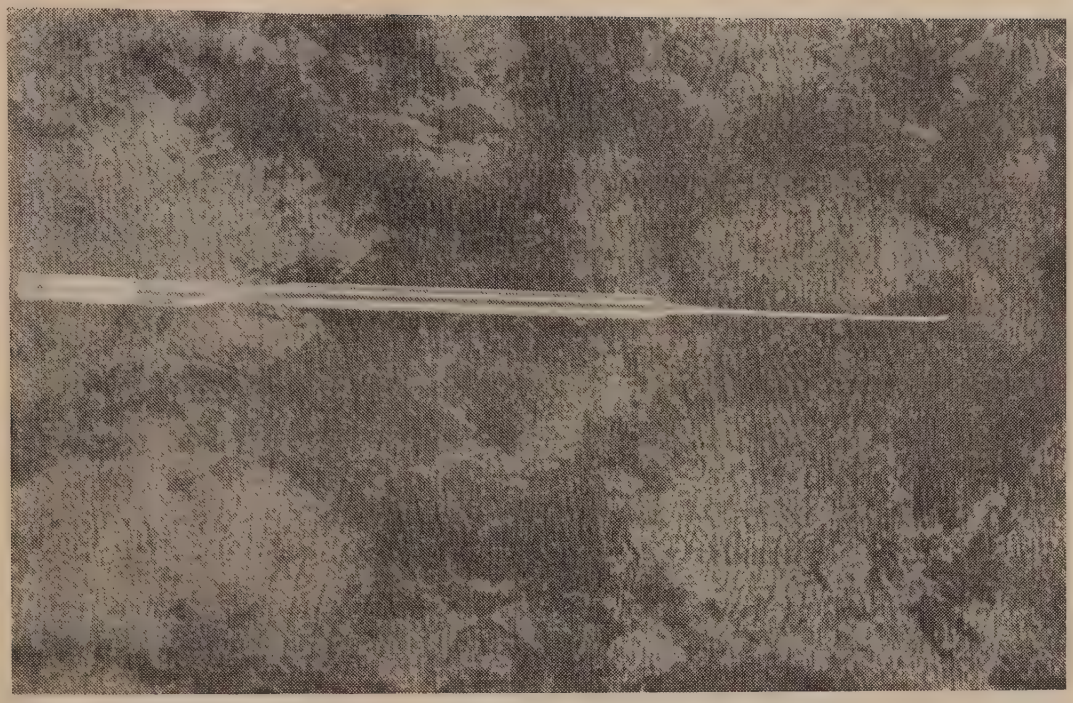

Fig. 17.—A. The pipette as supplied by laboratory consists of glass tube sealed at pointed end and plugged with cotton wool at other end The tube is constricted near plugged end to assist in sealing in the field. A rubber teat is to be attached to the plugged end.

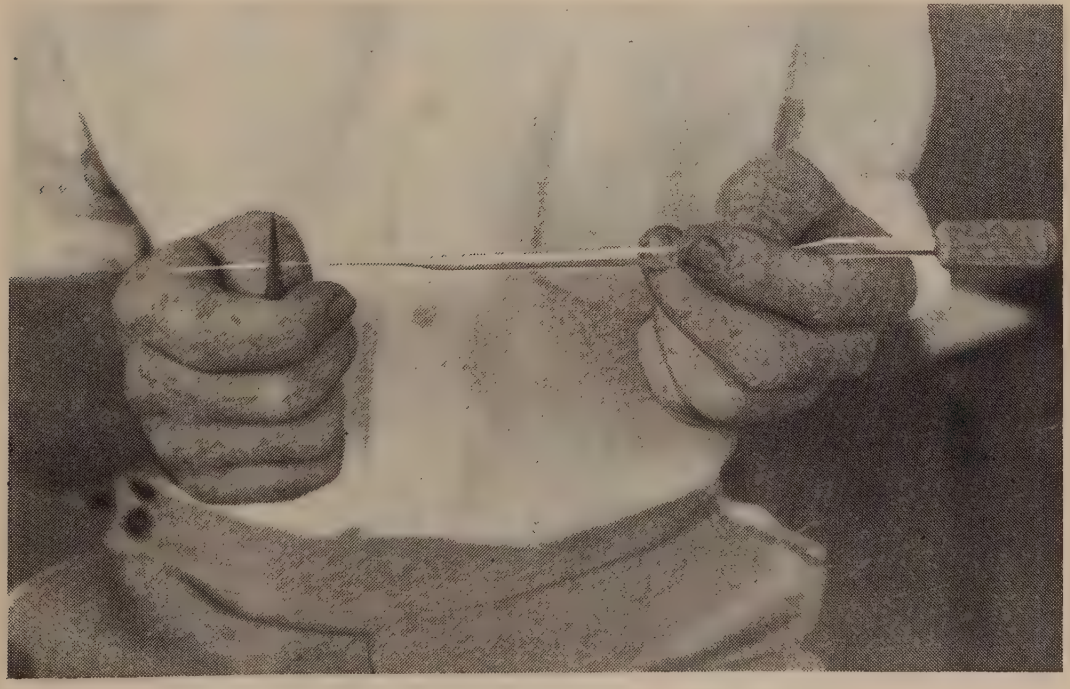

Fig. 18.—B. The sealed tip is broken off with a pair of forceps.

Fig. 19.—C. The end of pipette is passed through a flame three or four times to destroy contamination on the outside of the glass.

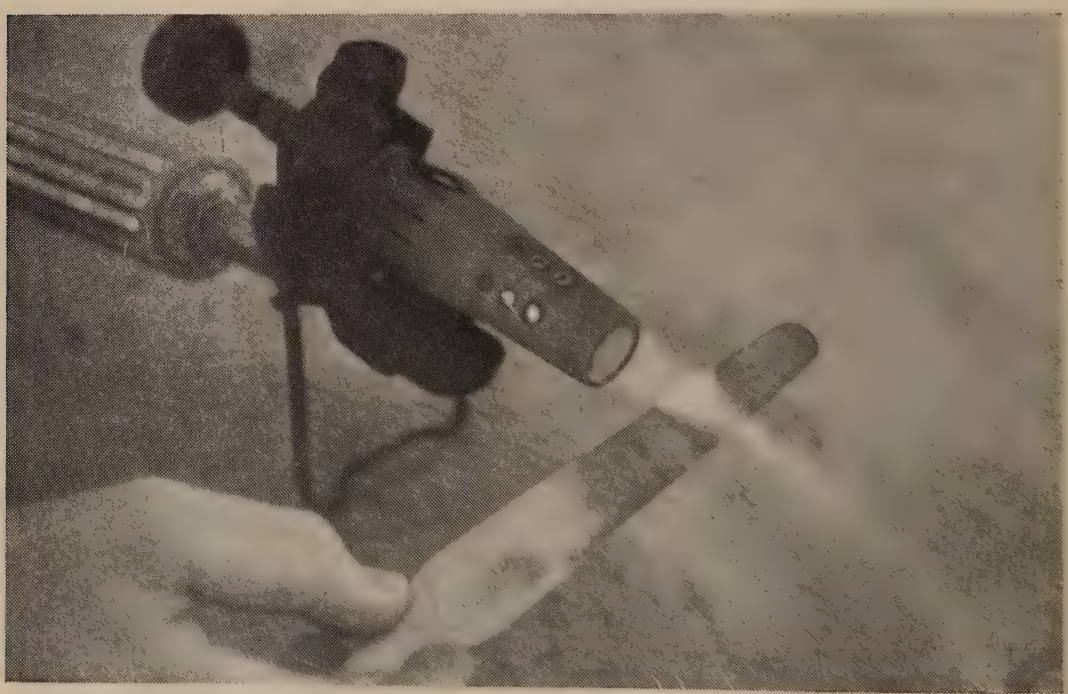

Fig. 20.—D. Heating a spatula or knife with the blowlamp.

Fig. 21.—E. The surface of the organ is seared with the heated spatula.

Fig. 22.—F. The fine end is inserted into organ where it has been seared. The tissue in neighbourhood of puncture is then broken down by manipulation of pipette and some material drawn up into pipette.

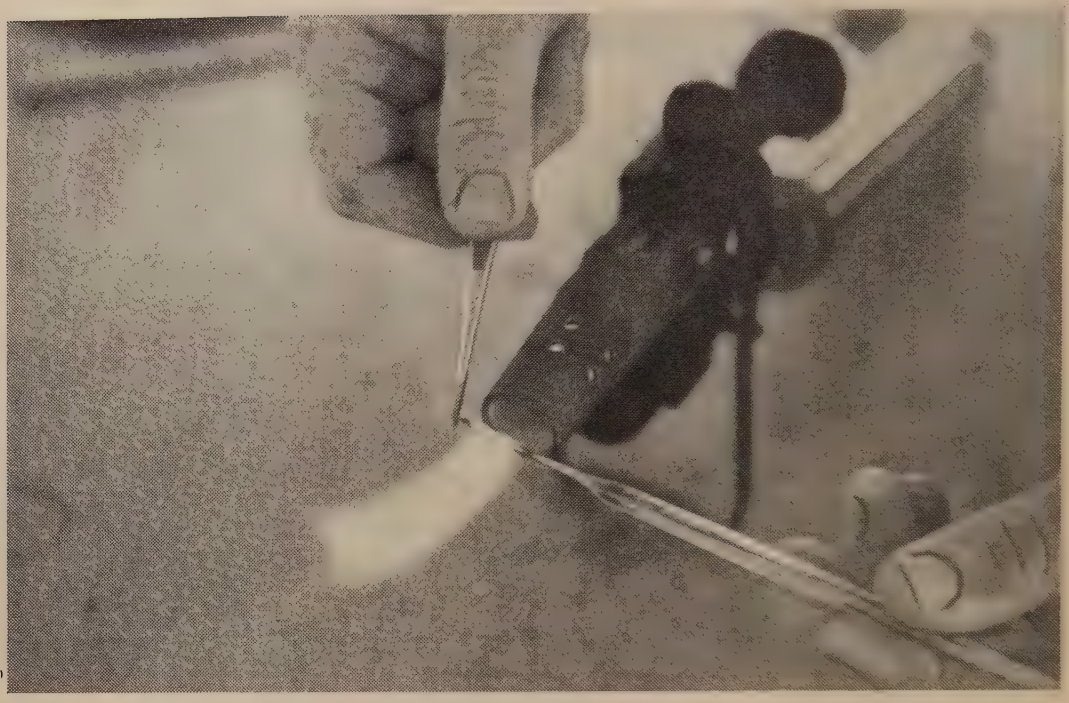

Fig. 23.—G. After ensuring that the material is well into the body of the pipette the tip is sealed in the blowlamp flame.

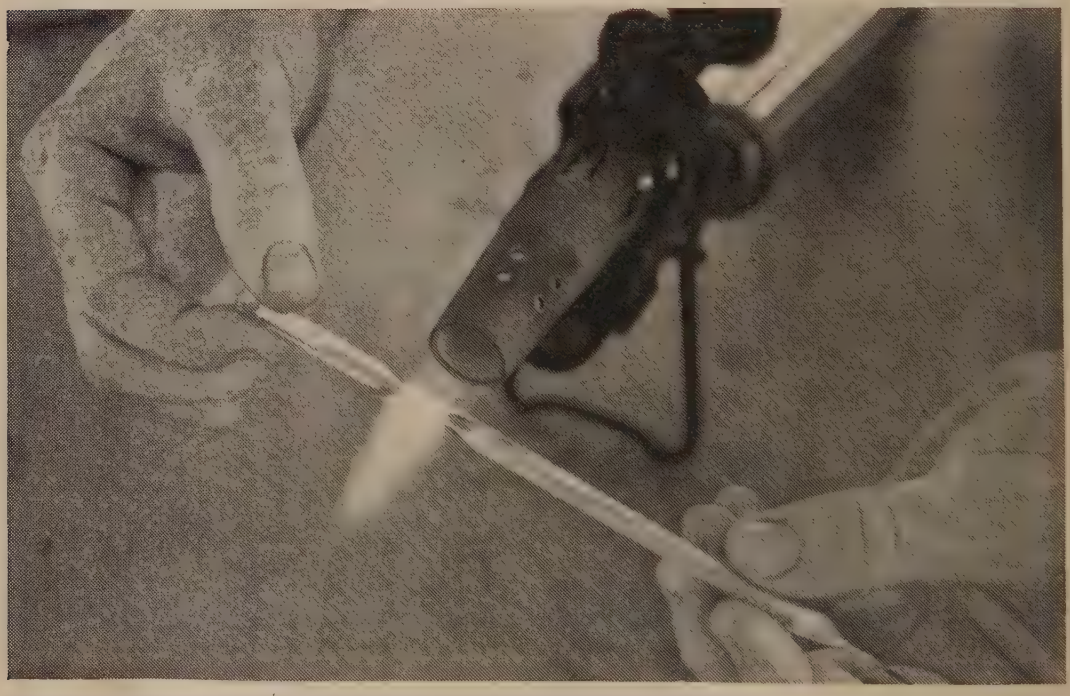

Fig. 24.—H. The pipette is sealed at the upper constriction.

Fig. 25.—I. The sealed pipette.

will heat the glass quickly and by making sure that the contents are well into the body of the pipette before heating the tip. If necessary, hold the body of the pipette in the palm of the hand to judge the heat of the glass.

Repeat the sealing process at the upper constriction.

Label the pipettes individually, and pack carefully in cotton wool.

11. MILK COLLECTION.

If milk samples will take longer than twenty-four hours to reach the laboratory, they should be collected in bottles containing *boracic acid*, otherwise they should be collected in sterile bottles.

Technique.—

Dry with a clean towel.

Wash the teats in warm water.

Thoroughly swab the end of the teat with methylated spirits.

Take care to avoid brushing the clean teats with hands, sleeves, etc.

Collect milk samples into individual bottles from each quarter, holding the bottle to the side and directing the milk stream almost horizontally into the bottle.

Label each bottle to identify each cow and quarter (LH, LF, RH, RF).

12. TISSUES FOR HISTOLOGICAL EXAMINATION.

It is not possible to make a satisfactory *histological* examination of tissues that have undergone any post-mortem decomposition.

Tissues preserved in salt or methylated spirits are unsuitable for *histological* examination.

Small (1 in. x 1 in. x ¼ in.) blocks of tissue should be removed from the organ or tissue and immediately dropped into a jar containing 10 per cent. *formalin*. These blocks must contain portion of the lesion and if possible the junction of the diseased portion with the apparently healthy tissue.

The *formalin* should occupy approximately ten times the volume of the tissues added.

Place the rest of the organ in a separate container and cover with 10 per cent. *formalin, or* wrap in a formalin-soaked cloth. Avoid excessive distortion of this specimen.

Do not force organs through the mouth of a jar—cut them until they will fit through easily.

13. LIMB BONE FOR BACTERIOLOGICAL EXAMINATION.

Any limb bone is suitable, the most convenient usually being the *cannon bone, humerus, radius, femur* or *tibia.*

Obtain the bone as soon as possible after death.

Clean the muscles off with a knife.

Make sure that the bone is not cracked.

Send promptly, unpreserved.

14. PLANT SPECIMENS.

Notes on the collection of plant specimens for botanical identification are given by Womersley, J. S. (1953) in the *Papua and New Guinea Agricultural Gazette,* Vol. 8, No. 2, page 62.

Wherever plant poisoning is suspected in livestock, forward :—

At least two sets of suspect plants as described by Womersley.

Fresh plant material in a clean sealed screw capped jar.

The following advice concerning the plant :—

(*a*) Locality from which plant gathered.

(*b*) Was plant grazed naturally or was it a tree that had been lopped for fodder ?

(*c*) Is plant a common one ?

(*d*) Does it grow in profusion or is it scanty ?

(*e*) Does it grow on dry land or is it a water weed ?

(*f*) Is it growing in a situation from which it would be convenient to obtain supplies for test feeding purposes ?

(*g*) Type of country, e.g. hilly, plain, rocky, alluvial, etc.

(*h*) Any other information which it is thought might be helpful.

15. CLEANING AND STERILIZATION OF EQUIPMENT.

A. *Cleaning.*—

Slides. Clean well by rubbing between the fingers with Bon Ami. Allow Bon Ami to dry. Polish with clean cloth. Store in methylated spirit. Immediately before use, wipe off excess spirit and polish with a clean, dry cloth.

All other equipment. If possible avoid using jars that have contained chemicals. Wash well in warm soapy water. Rinse off soap and dry.

B. *Sterilization.*—

Always allow equipment that has been sterilized by heat to cool before touching the specimen. Equipment should not be regarded as sterile unless it has either (*a*) been supplied by the laboratory as sterile and has subsequently remained sealed and unbroken, or (*b*) been sterilized by one of the following procedures :—

Bottles and jars must contain a cardboard or preferably a rubber liner in the lid.

Clean as above.

Screw the lid down loosely.

Sterilize in a pressure cooker or autoclave for twenty minutes at 20 lb. pressure,

or

place in the oven of a stove and give about one hour at moderate oven temperature—170 deg. C. (Containers with rubbers cannot be sterilized in the oven.) A piece of white paper left in the oven with the jar should be slightly browned after one hour if the correct temperature is used. Tighten lids immediately after they are cool.

Do not remove the lid of sterile jars except for the minimum time when collecting specimens.

Avoid touching or contaminating the mouth of the jar or inside of the lid during collection of the specimen.

Pipettes are sterile as supplied by the laboratory. If the tip is broken, it is better to discard the pipette.

Knives, forceps, scissors.—

(*a*) If possible these should be kept in boiling water while collecting specimens.

(*b*) The cutting edge or part touching the specimen may be sterilized by passing through a flame for a few seconds immediately before use, but this procedure quickly ruins the instruments.

Wire loop. Heat in a flame to redness and allow to cool before touching the specimen.

Spatula. Heat well in a flame and touch the surface of the organ or tissue *before* cooling. This procedure sterilizes the surface of the organ.

Slides. Do not require sterilizing—clean as above.

16. ABSCESSES.

Live animal.—

It is preferable to obtain pus before spontaneous rupture of the abscess, if possible.

Clip overlying hair.

Cleanse skin with swabs of methylated spirit.

Allow spirit to dry.

Incise the lesion with a sterile knife [15(*b*)].

Collect the pus in a small sterile bottle or in pipettes (10). Obtain pus near the wall of the abscess, if possible.

Make three thin pus smears (9).

If the abscess has *ruptured* an attempt should be made to collect pus from the depths of the abscess.

Dead animal.—

Collect pipettes and smears of pus as for live animal, or preferably after sterilizing the surface by searing (10).

Send also small portions of the lesions for *histological* examination (12).

If internal organs such as liver, kidney, etc., contain abscesses, send pipettes and smears and large pieces of the affected organ in formalin.

Advise.—

Where abscess was found in the body.

Whether other abscesses were present.

Size of abscess.

Amount, colour and thickness of the pus.

Nature of abscess wall (thick or thin fibrous tissue).

Whether abscess had ruptured before collection of specimens.

17. ABORTIONS AND STILLBIRTHS.

Where the *foetus* can be delivered in a fresh condition to the laboratory, this is the best specimen.

If the *foetus* would be too decomposed on arrival, it should be autopsied and the following specimens forwarded :—

Pipettes of *foetal* liver (10).

Pipettes of *foetal* stomach content (10).

Pipettes of *foetal* lung (10).

Three smears of *foetal* stomach content (9).

Three smears of *foetal cotyledons* (8).

Pieces of liver and *cotyledons* for *histological* examination (12).

Also send from the dam :—

Blood serum sample (6c).

Milk sample, about $\frac{3}{4}$ of bottle (11).

Vaginal mucus in sterile bottle [46(*a*)].

Three air-dried smears of *vaginal mucus* (9).

From milking herd send also :—

Bulk milk sample from the pooled milk of the herd.

Advise.—

Age of *foetus* (if date of service known).

Size of *foetus.*

Whether *foetus* carries hair.

Temperature of dam, taken as soon after abortion as possible.

Whether dam had been driven, transported, or otherwise physically exerted, prior to abortion.

Whether *foetus* shows any signs of goitre (if so send appropriate specimens (25).

Whether dam or other animals in the herd had any previous breeding failures.

18. ANAEMIA.

Anaemia may be suspected in animals showing persistent paleness of membranes of the mouth and eye. It is often accompanied by poor conditions and dropsical swellings of the jaw (bottle jaw), limbs, brisket, or *external genital organs.*

Specimens.

Live animal.—

Three blood smears (7).

One citrated blood sample (6b).

Duplicate faecal samples for parasitic examination (42).

Urine sample (containing six drops of *formalin*) (55).

Dead animal.—As for live animal plus :—

Pipettes (10) of liver and kidney.

Three liver and three kidney smears (8).

Large piece of liver for mineral analysis (35).

Rest of liver in 10 per cent. *formalin.*

Examine the gut for internal parasites.

Advise.—

Age of affected animal.

How long animals have shown indications of anaemia.

Any associated symptoms such as *scouring* (49), swellings (51), emaciation (44), red urine (55), etc.

Full details of ration.

How long the animal has been on the property.

19. ANTHRAX.

Anthrax is known to occur in certain areas of New Guinea. It has been positively diagnosed only in pigs.

In cattle and sheep anthrax is usually quickly fatal. The carcasses putrefy rapidly and blood-stained fluid exudes from the anus, vagina and nostrils. The disease is less acute in horses and pigs. These animals usually show swelling of the throat, which, on incision, will be found to contain a gelatinous fluid.

Animals suspected of dying of anthrax should not be autopsied.

Submit the following specimens :—

Cattle, sheep and goats.—

Four blood smears from ear (7).

Horses and pigs.—

Smears (8) and pipettes (10) from throat *lesions.*

Advise.—

How long the animal was noticed ill before dying.

Temperature, if taken when alive.

How long the animal was dead before specimens were taken.

20. BLOOD ABNORMALITIES.

The appearance of the blood should be noted at any post-mortem examination and if abnormal send :—

Four blood smears (7).

One citrated blood sample (6B).

Two limb bones (13).

Advise.—

Appearance of the blood (dark or pale).

If blood is obviously pale see anaemia (18).

21. BONE CONDITIONS.

Small animals with bone deformities are best forwarded to the laboratory alive.

Large animals.—

Obtain typically affected bones at post-mortem examination.

Remove excess meat.

Forward whole bone without preservative.

Send also two unbroken ribs [35(*b*)] and liver for mineral analysis [35(*a*)].

If bones carry abscesses or any other signs of infection :—

Take sample of pus in pipette (10) or sterile bottle.

Make four pus smears (9).

Forward specimens promptly.

Advise.—

Number of animals affected.

Details of ration.

Whether ribs are strong (snap) or weak (bend) at post-mortem examination.

22. EXUDATES.

Excess fluid in the abdominal or *thoracic cavities* should be collected as quickly as possible in pipettes (10) or sterile bottles. Such fluids become rapidly contaminated at post-mortem examinations and should be forwarded promptly to the laboratory, together with three smears (9) of the fluid.

It is preferable to collect any fluid from the heart sac *before* opening the sac.

Sear the outside of the sac (10).

Pierce with tip of pipette.

Collect fluid in pipette.

Forward two pipettes.

Advise.—

Estimate of amount of fluid.

Colour of fluid.

Whether fluid clear or turbid.

Whether any other abnormalities were present in the cavity concerned, e.g. *haemorrhage, adhesions, fibrin deposits.*

Whether the exudate fluid clots quickly.

23. EYE DISEASES.

(A) *Discharges.*—

Restrain the animal properly before collecting discharges from affected eyes.

Separate the eyelids.

Examine eye for eye worms, any grass seeds or other foreign bodies.

Collect tears with pipette from the cavity formed by lower eyelid.

Make three smears of tears or of the material lightly screwed from inside the lids. If tears contain pus, smears should be made thin, if not, thick smears may be made.

Advise.—

Whether one or both eyes affected.

Number of animals affected.

Whether clouding of cornea or other abnormalities present.

(B) *Tumours of Eyelids* (from post-mortem examination or surgical removal).—

Remove small portion for *histological* examination (12).

Place rest of tumour in 10 per cent formalin.

(C) *Whole eye from dead animals.*—

Make single incision through thick outer coat of eyeball with sharp knife.

Place eyeball in 10 per cent. *formalin.*

Advise.—

Complete description of any symptoms shown by animal.

Abnormalities noticed in eyeball before placing in formalin.

(D) Small animals with eye affections may be forwarded to the laboratory alive for examination and if necessary for post-mortem examination.

24. FEVER.

Directions for taking the temperature of an animal are given in Section 3 (g).

Always shake the mercury back in the thermometer and recheck a high reading.

Temperatures above the following figures in animals at rest under normal atmospheric conditions (not excessively hot or humid) may be regarded as indicating a sufficient degree of fever to warrant forwarding specimens :—

Cattle	105 degrees	Horses	103 degrees
Sheep	106 „	Fowls	108 „
Goats	106 „	Dogs	106 „
Pigs	105 „	Cats	106 „

From such animals, forward the following specimens :—

(*a*) Four blood smears from ear vein (7).

(*b*) A *citrated blood sample* collected as follows :—

Sterilize in a pressure cooker, a 20 c.c. syringe with needle attached and about one ounce of sodium citrate.

Clip and shave the hair over the jugular vein.

Sterilize the skin with methylated spirits.

Allow spirit to dry.

Draw 2 c.c. of *sodium citrate* into the syringe.

Insert the needle into the jugular vein (6).

Withdraw blood to the 20 c.c. mark on the syringe.

Remove syringe and needle from vein and invert to mix the citrate with the blood.

Take the syringe indoors and remove the needle.

Immediately eject the blood into a sterile one ounce bottle (15B).

This specimen must be kept cool, and may be of little use if it is longer than twenty-four hours in reaching the laboratory.

Advise.—

Temperature of animal.

How long animal was sick.

Atmospheric conditions at time of taking temperature.

25. GOITRE.

1. Remove the entire *thyroid* from the affected animal at post-mortem examination.

2. Cut off two small pieces for *histological examination* (12).

3. Place rest of gland unpreserved in a well sealed clean container.

Advise.—

Whether animals are receiving any iodine or salt supplement.

The laboratory would be interested in receiving *thyroid* specimens of other animals (cattle, horses, pigs, poultry) from areas in which *goitre* is known to occur in goats or humans.

Avoid using containers or instruments which may have had contact with iodine or iodine salts.

26. GROWTHS, TUMOURS, CANCER, NEOPLASMS.

Remove two portions of the growth for *histological examination* (12).

Place the rest of the growth in 10 per cent. *formalin* or wrap in a formalin cloth (12).

Advise.—

Where growths were found in the body.

Whether other growths were present.

Size of the growth.

Any change in the appearance of the growth since it was first noticed.

At post-mortem examination inspect rest of the body, especially liver, spleen, lungs, kidneys and *lymph nodes* for secondary growths.

Forward any affected internal organs in separate containers.

27. HEART ABNORMALITIES.

From a heart showing any abnormalities submit the following specimens :—

Pipettes of the heart sac fluid (10).

Three smears of heart sac fluid (9).

Pipettes of heart blood (10).

Three smears of heart muscle (8).

Pieces of affected areas for *histological examination* (12).

Rest of heart in 10 per cent. *formalin* (12).

Advise.—

Appearance of heart at post-mortem examination.

See also *Exudates* (22).

28. JAUNDICE, ICTERUS.

Jaundice is a yellow staining of the tissues and fluids of the body with bile pigments. It is a sign of various pathological conditions and is not a disease entity. In the living animal it is best seen by examining the membranes of the mouth and eye. At post-mortem examinations it may be noticeable throughout the carcass.

Forward.—

One *sterile citrated blood sample* [24(*b*)].

One *blood serum sample* (6c).

Three blood smears (7).

Two urine samples (55*a* and *b*).

Advise.—

Temperature of affected animal.

Whether urine discoloured.

Whether skin *lesions* present.

Details of pasture.

Dead animals.—

Forward specimens as for live animal plus :—

Smears (8) and tissues for *histological examination* (12), from liver and kidney.

One pound of liver in a clean jar.

Rest of liver covered with 10 per cent. *formalin* (12).

Parts of affected skin (if any) in 10 per cent *formalin*.

One pound of rumen content covered with 10 per cent. *formalin*.

One pound of unpreserved rumen content.

29. JOINTS.

Live animal.—

Where possible animals showing swelling of joints should be submitted alive.

If the joint is obviously enlarged and appears to contain excess fluid a sample may be collected as follows :—

Restrain the animal well. It may be necessary to throw a large animal and lash the limb to a strong post.

Clip and shave the hair over the most prominent part of the joint swelling or where the swelling is softest.

Clean the skin well with methylated spirit swabs.

Allow the spirit to dry.

Insert a sterile hypodermic needle into the swelling (gauge 18 for large animals, gauge 20 for smaller animals).

Fluid will start to drip from the needle when it is in the joint.

Attach a sterile syringe to the needle and withdraw some joint fluid.

Eject the fluid into a sterile bottle.

Difficulty will be experienced if the fluid contains pus and it is too thick to pass through the needle.

Dead animal.—

Remove skin from over the affected joint, sear tissues covering the joint, insert pipette and withdraw fluid (10).

Make two smears of joint fluid (9).

Saw or chop through the bone about three or four inches on either side of the affected joint and place in 10 per cent. *formalin* with the joint intact.

Advise.—

Age of animal.

Number of animals affected.

Whether any other *lesions* found, especially in heart, liver, spleen, kidney, *lymph nodes,* or navel; if so submit appropriate specimens.

30. KIDNEY ABNORMALITIES.

From kidneys showing any abnormalities submit the following specimens :—

Pipettes of kidney *lesions* (10).

Smears of kidney *lesions* (8).

Pieces of *lesion* for *histological examination* (12).

Rest of kidney in 10 per cent. *formalin* or formalin cloth (12).

Advise.—

Appearance of kidneys at post-mortem examination.

31. LAMENESS.

Most cases of lameness should be diagnosed in the field. A search should be made for any signs of wounds (56), swelling of joints (29) or muscles (37), or bone abnormalities, abscesses (16), *skin lesions* (47), and specimens submitted as indicated under these headings.

It is most important that the foot of the hoofed animals should be thoroughly examined. The ground surface (sole) of the foot should be thoroughly cleaned and a close inspection made for wounds or foreign bodies.

If foot rot is suspected, forward pus smears (9) from beneath infected horn or swollen *coronet.*

Advise.—

Describe lameness as accurately as possible. Lameness should not be confused with ataxia (staggers) or paralysis (40) in which the abnormal gait is the result of nervous disease rather than disease of the limb.

32. LIVER ABNORMALITIES.

From liver showing abnormalities send the following specimens :—

Pipettes of liver *lesions* (10).

Smears of liver *lesions* (8).

Pieces of *lesion* for *histological* examination (12).

One pound of liver unpreserved, from large animals, or half a liver unpreserved from small animals, in a clean jar.

Rest of liver in 10 per cent *formalin* (12).

Advise.—

Appearance of liver at post-mortem examination.

33. LUNG ABNORMALITIES.

From lungs showing abnormalities send the following specimens :—

Pipettes of lung *lesions* (10).

Smears of lung *lesions* (8).

Pieces of lung *lesion* for *histological* examination (12).

Examine also *mediastinal lymph nodes* (34) and if enlarged or abnormal submit appropriate specimens in separate containers.

Examine also the *trachea* (windpipe) and submit the following :

Smears of *tracheal mucus.*

Pipettes of *tracheal mucus.*

Advise.—

Appearance of lung at post-mortem examination.

Feel of affected parts—normal, spongy, liver like, water logged, etc.

34. LYMPH NODE ABNORMALITIES.

From abnormal *lymph nodes* send the following specimens :—

Pipettes of affected *lymph node* (10).

Smears of affected *lymph node* (8).

Pieces of affected *lymph node* for *histological* examination (12).

If a number of *lymph nodes* are affected include also some complete *lymph nodes,* unopened and unpreserved, in sterile bottles. Keep cool (5).

Advise.—

Estimate of size of *lymph node.*

Location of swollen *node.*

Any other *nodes* swollen?

Appearance of affected *node* at post-mortem examination.

35. MINERAL DEFICIENCIES.

Deficiencies of minerals in the ration or pasture give rise to various symptoms in livestock. Some of the common signs are poor condition, *unthriftiness*, weak or deformed bones, weak *unthrifty* young, animals easily fatigued, persistent diarrhoea, chewing of bones, anaemia and incoordination of gait.

Deficiencies of salt, iodine, phosphorous, calcium, copper, cobalt and manganese may occur in certain areas. In many instances symptoms may be referable to combined deficiencies of two or more minerals.

Persons requiring investigation into the mineral status of their stock should make special arrangements with the laboratory, as special techniques and materials are required according to the mineral deficiencies to be investigated.

It is suggested that stock owners take advantage of any opportunity to obtain the following specimen from animals dying on their property or animals killed for meat :—

(*a*) Thoroughly clean a large jar (one or two pound) with a bakelite lid. Dry.

Cut a clean piece of cardboard to fit the lid.

Place a single large piece of fresh liver in the jar. Avoid cutting into this piece.

Do not preserve. Keep as cool as possible.

(*b*) Cut out three or four ribs from the carcass.

Clean off excess meat.

Forward unbroken and unpreserved.

(*c*) *Thyroid gland* (25).

Advise.—

Full details of the ration and pasture.

How long the animals have been on the property.

General condition of the herd.

36. MOUTH AND OESOPHAGUS ABNORMALITIES.

Live animals.—

The animal should be suitably restrained before attempting to collect material from abscesses (16).

Ulcers should be gently rinsed with clean water.

Make three smears by scraping the *ulcer* surface with a sterile wire loop (15B) or with a spreader slide (8).

Blisters. Swab blister surface with clean water.

Aspirate blister contents with syringe or pipette (10).

Seal pipette and forward.

Make three smears from blister fluid.

Dead animal.—

Treat as above, and send also :—

Pieces of *lesions* for *histological* examination (12).

Rest of tongue, lips or affected organ in 10 per cent. *formalin* (12).

Affected jaw bones may be treated as under Bones (21).

Examine *lymph nodes* of head and tongue (34) and send appropriate specimens if abnormal.

37. MUSCLE ABNORMALITIES.

From muscle lesions forward the following specimens :—

Pipettes of affected muscles (10).

Smears of affected muscles (8).

Pieces of muscle for *histological* examination (12).

A piece of muscle tissue placed in a sterile bottle unpreserved (15B).

Rest of muscle in 10 per cent *formalin* (12).

From animals dying of acute diseases showing muscle swellings or discolouration send also a limb bone for bacteriological examination (13).

38. NERVOUS DISORDERS.

Disorders of the nervous system may be indicated by unusual habits, abnormal movements, abnormalities of gait (staggers, walking in circles), dullness, depression or unconsciousness. Many of these signs may also be shown in other conditions such as poisoning, deficiency diseases or acute infections. It is therefore most important to give a complete and accurate history and description of symptoms when submitting specimens. Mention especially how long the animal had shown nervous symptoms.

Live animals.—

Specimens from live animals may not be of much use for laboratory assistance in diagnosing nervous conditions, excepting cases of nervous conditions associated with pregnancy and lactation. In most instances

it may be preferable to contact the laboratory and discuss fully the symptoms shown.

The following may be of use :—

(*a*) *Blood serum sample* (6c).

(*b*) Sterile *citrated blood sample* [24(*b*)].

(*c*) Pipettes of associated nasal (39) and eye (23) discharges.

(*b*) and (*c*) are likely to be of use only during the fever stage of the illness.

Dead animals.—

If specimens are to be forwarded from an animal with a nervous disease, avoid killing the animal by shooting through the head, or stunning.

Detach the head from the carcass.

Place the cut surface on a clean block of wood or other clean firm surface and hold head vertically by one hand grasping the nostrils.

With a meat chopper, bush knife or axe, carefully open the skull to expose the brain, as done by butchers (Fig. 10). Try to avoid damaging the brain.

Sear the brain surface (or surface of meninges, if still intact) and take pipettes from each side of brain (10).

Remove a piece of brain tissue about one inch square and place in sterile *glycerol saline* or keep refrigerated in a sterile bottle. Avoid contamination of this piece. Use sterilized instruments and containers (15b).

Turn the head upside down and clip through the nerves and attachments with a pair of scissors, allowing the brain to fall out into a container of 10 per cent. *formalin.*

Send also :—

Blood serum sample (6c).

A piece of liver for *histological* examination (12).

One pound of unpreserved liver.

A complete autopsy should be performed and appropriate specimens forwarded from any organs showing abnormalities.

39. NOSE AND UPPER RESPIRATORY TRACT DISEASES.

Live animal.—

Before attempting to collect samples of nasal discharge the animal must be under good restraint to prevent movement of the head.

Contamination of nasal discharges from outside renders them rather unsatisfactory for bacteriological examination. However if the samples are refrigerated the growth of contaminating organisms is reduced to a minimum.

Collect as much as possible of the discharge from the exterior into a sterile bottle.

Clean the nostrils well with moist swabs.

Flame the broken end of a pipette well to smooth the broken glass.

Make sure the pipette is cool before proceeding.

Introduce the pipettes as far as possible into the nose without touching the nostril and collect a sample of the discharge in the pipette.

Make smears of the discharge.

Refrigerate the bottle and the pipette.

Routine bacteriological examination of nasal discharges may be unsatisfactory for diagnosis of the condition. Special techniques may be necessary and the history is all-important in determining what technique is required. Consequently particular attention must be paid in forwarding the following advice :—

Is the discharge from one or both nostrils ?

How long has the animal had the discharge ?

What is the nature of the discharge (e.g. frothy, watery, thick ; profuse or scant ; contains blood, pus or rust streak ; any abnormal odour).

Does the animal sneeze or cough ?

Is there any other respiratory noise ?

Does the animal shake its head or hold it on one side ?

Is there any eye discharge ? If so, see Section 23.

Is there any swelling of the face, glands of the throat, or under the ears ?

Does the animal breathe through both nostrils ? This may be tested by holding the hand in front of each nostril in turn.

An examination of the teeth should be made to determine whether they are infected.

Dead animals.

The method of opening the head is discussed under the examination of dead animals (4).

Take pipettes of abscesses, any abnormalities of the nasal cavities, *sinuses* or *head lymph nodes* immediately after opening the head.

Take also pipettes and smears of the *trachea* mucus.

When these specimens are taken place the head or as much of the nasal part as possible in a clean container with the nose uppermost and cover with 10 per cent. *formalin*. If any large swellings are present these should be incised before placing in *formalin* to allow the preservative to penetrate.

40. PARALYSIS.

Live animal.—

Whenever possible a paralysed animal should be submitted to the laboratory alive. Otherwise the following specimens may be of use in some cases :—

Blood serum sample (6).

Blood samples for special bio-chemical tests—contact the laboratory for special containers and instructions for their use.

Advise.—

Was the paralysis sudden or gradual ?

How long has the animal been paralysed ?

Is the appetite normal ?

Describe exactly how paralysed—one limb (hind or front), both hind or front, etc., position in which paralysed limb(s) held.

Is there any accompanying swelling of joints or muscles, wasting of muscles, signs of injury ?

Is the paralysed limb sensitive—test by touching between the toes with a stick which should cause withdrawal of the limb.

Is the paralysis complete or partial ? i.e. is the animal absolutely unable to use the limb, or does it have difficulty in doing so ?

Is the tail *flaccid* or firm ?

Can the animal move the tail ?

Persons familiar with the technique should test the *patella* reflex and note whether the response is normal.

Does the animal pass urine and *faeces* normally ?

Is the skin of the paralysed limb normal ?

Are the mucous membranes of the mouth or eye, normal or pale ?

Give full details of ration or pasture and any suspicious poisonous plants.

Dead animal.—

At autopsy record abnormalities in any organs and forward appropriate specimens.

Forward also :—

Blood Serum sample (6c).

One pound of liver for mineral analysis [35(*a*)].

Three ribs unbroken [35(*b*)].

The main nerves of the affected limb in 10 per cent. *formalin*.

The spinal cord in 10 per cent. *formalin*.

This should be removed as follows :

Remove the fillet muscles from each side of the spinal column.

Place a rope or halter on the head and loop the free end over the centre of the gambrel. Draw the head up and backward with the rope. This will flex the vertebral column into the abdominal cavity. If a gambrel is not being used, the vertebral column may be flexed into the abdominal cavity by placing the carcass on a bench or table with the hind legs hanging over the edge.

Sever the discs between the bodies of the vertebrae with a knife.

Cut each vertebra through on both sides with a chopper or a pair of bone forceps. By starting at the tail end and working towards the head, the spinal cord is easily exposed by removing each vertebra in turn.

If necessary cut through any ligaments with a pair of scissors after cutting the bone.

The spinal cord will now be exposed lying in the vertebral canal and may be removed gently by cutting away attachments with scissors.

It will be noticed that in the region of the loins the cord terminates in a number of nerves. As much of these as possible should be left intact, and the whole organ placed in 10 per cent. formalin.

Advise.—

As for live animal, plus :—

Appearance of spinal cord and limb nerves at post-mortem examination.

REMOVAL OF SPINAL CORD.

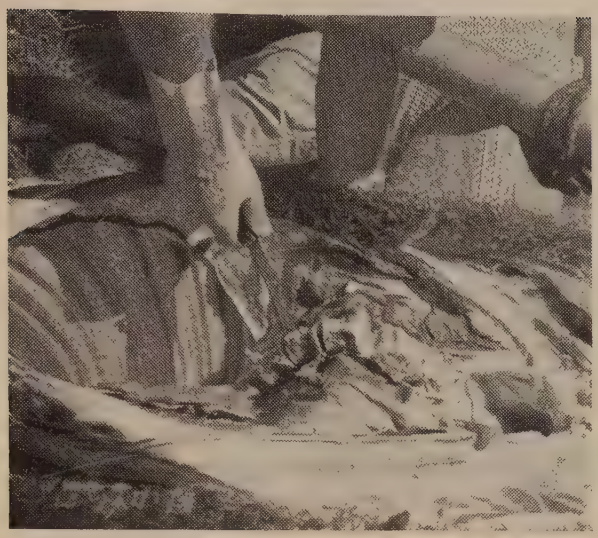

Fig. 26.—A. The vertebral column has been flexed into the abdominal cavity by drawing the head up and backward with a rope passed over the gambrel. The discs between the bodies of the vertebrae are being severed with a knife.

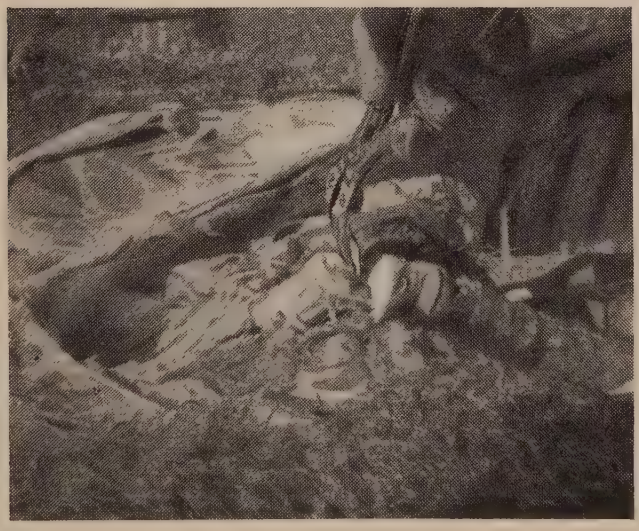

Fig. 27.—B. A pair of bone forceps is being used to cut the attachment of the vertebra on each side.

Fig. 28.—C. The spinal cord is removed by cutting away its attachments with scissors.

41. PARASITES—EXTERNAL.

If parasites are noticed in the hair, feathers or skin of the animal a number should be collected and forwarded as follows :—

Flies. Kill by exposure to a strip of blotting paper soaked in chloroform. Then either—

(*a*) pin the fly to the bottom of a cork with an ordinary household pin (or an entomological pin No. 20) and insert the cork into an empty bottle so that the fly is enclosed ; or

(*b*) pack in a small piece of cotton wool and place between two layers of cotton wool without pressure. Place a little naphthalene or preferably Para-dichlor benzene in the container. Do not place flies loose in a container as this may break off antennae which are important for identification. Do not place in fluid as this may change colours which are important for identification.

Fly Larvae (Maggots). Forward in Alcohol-glycerin or in 70 per cent. alcohol.

Lice, Fleas and Mites. Forward in 70 per cent. alcohol.

Ticks. Where possible forward alive in well closed, large containers. If ticks are large allow air access through small holes pierced in the lid. If small, ticks may be forwarded in 70 per cent. alcohol.

If animals show skin *lesions* suspected of being *mange* see Section 47.

Advise.—

Whether skin shows any loss of hair, thickening or other abnormalities.

How many animals are affected ?

Are many parasites present ?

42. PARASITES—INTERNAL.

Live animals.—

If worm infestation is suspected forward *faecal samples* collected as in 49. Collect samples from the animal's rectum and not from the ground. Samples from a number of animals give more conclusive results.

Collect two *faecal samples* from each animal in 2-4 oz. jars.

To one add 4-8 c.cs. of 10 per cent. *formalin* per 2-4 oz. of *faeces* before forwarding.

Send the other unpreserved.

Ensure that the containers are properly closed and packed.

These specimens must be forwarded promptly as delay means the specimen will be useless. It is suggested that the specimens be collected just prior to air-despatch and make sure that the unpreserved *faecal samples* reach the laboratory within three days of taking samples.

Advise.—

Reason worm infestation suspected.

Dead animals.—

(*a*) Parasites may be found in various locations in the animal at post-mortem examination and, apart from the gut, the following organs should be searched for them :—

The hindquarters (may show signs of diarrhoea, or in the case of horses, pinworms around the anus); the eyes, mouth, nasal cavity and sinuses; the thoracic and abdominal cavities, the heart cavities, heart musculature and associated blood vessels; the lungs (look for evidence of pneumonia, nodules or abscesses), the trachea, bronchi and their branches; the liver (look especially for cysts of tapeworms and for small white scars which may represent damage by migrating larvae), the bile ducts and gall bladder (open the branches of the bile duct with scissors and search for flukes); the kidneys and urinary bladder, the arteries supplying the gut (particularly in the horse); the oesophagus, and in birds, the crop, proventriculus (look especially for blood-red worms—*Tetrameres* sp.); oviduct and cloaca (look especially for flukes). The brain may carry parasites and should be examined in animals that have shown nervous symptoms. If a hand lens is available the tracheal mucus should be examined for lungworm larvae.

(*b*) *Examination of the gut.* After the removal of the gut, place double string ligatures between the stomach and small intestine and between the small and large intestines and divide the gut into the three sections by cutting between the ligatures.

Open each section (stomach, small intestine and large intestine) separately.

In smaller animals place the contents and the gut of each section in separate containers.

Search each section for parasites. As they are found remove and place into normal saline solution.

Many of the smaller nematodes are freqently overlooked. The mucous membrane must be examined very carefully and scraped into the appropriate container with a scalpel or glass slide. Small portions of the gut content and mucosal scrapings should be placed in a glass dish and water added to cover the bottom by about half an inch. If the gut content is then dissolved by stirring, small parasites may be seen by examining with transmitted light against a dark background.

In larger animals. A general search of gut contents should be made for parasites, and mucosal scrapings made from representative sections of about one foot length at the beginning, middle and end of the small intestine, the part of the large intestine nearest the entrance to the blind gut and the end of the blind gut.

Any parasites collected should then be treated as follows :—

Roundworms.—Wash in normal saline solution. Do not place in water or roundworms may burst.

Kill by placing in hot water or hot 3 per cent. *formalin* at about 70 deg. C. (this has the advantage of causing them to die in an extended condition).

After a minute in the hot solution, remove and place in alcohol-glycerin or MFG Solution.

Tapeworms.—The heads of tapeworms are usually embedded in the wall of the small intestine. At post-mortem examination the worms should not be pulled away from the wall, or the head, which is important for identification, will be torn off. The correct procedure is as follows—

Cut off the portion of the intestine containing the head and place it, with the entire worm attached, in fresh water. After a while it will detach from the wall or be very readily detached.

After it has been detached leave for an hour or two in fresh water to clean. Forward in about ten times their volume of 3 per cent. formol saline

For large worms the formol saline should be changed after two days.

MFG solution is a suitable preserving fluid. Do not use spirit for preservation of tapeworms.

Acanthocephala.—Treat as for tapeworms.

Flukes.—After removing from the host carefully wash in normal saline until all traces of mucus, blood or faecal matter have been removed from the surfaces.

Small flukes.—If dead drop into 3 per cent. formol saline.

If alive place in a test tube half filled with saline. Place thumb over the end of the tube and agitate rapidly for half a minute. This causes the flukes to relax. Quickly add 6 per cent. formol saline to the tube until nearly full and continue agitation for another half-minute. This fixes the flukes in the extended condition.

Later place in MFG solution.

Large Flukes.—Lay flat on a piece of glass and place a second piece of glass on top. Run 3 per cent. formol saline between the two glasses.

Leave for an hour, then transfer the dead flukes to a container of 3 per cent. formol saline or MFG solution.

Snails which serve as intermediate hosts for various flukes should be forwarded in a cigarette tin with perforated lid to allow air access, dead snails may be useless for examination. Pack in damp moss, or if this is not available, in damp cotton wool without excess water.

Collect shortly before despatch and send by plane.

Radio the laboratory to ensure that the snails are collected without delay.

43. POISONING.

If animals are suspected of dying of poisoning make a thorough search of nearby pastures, rubbish dumps, store houses, etc., for any signs of the animals having eaten poisonous plants or chemicals. Forward the following specimens in separate clean containers :—

One pound of liver, unpreserved.

One kidney from cattle or horses, or both from smaller animals.

All of the stomach or abomasum and contents, unpreserved.

Make a search of the rumen or stomach content for evidence of chemicals or poisonous plants and note the odour of the rumen or stomach content.

Suspect plant material from the rumen should be placed in a clean jar and covered with 10 per cent. *formalin.*

One pound of *rumen content,* unpreserved.

One pound of *rumen content*—squeeze out liquids—place in a clean jar and cover with 10 per cent. *formalin.*

Samples of suspected poisonous material in a clean jar.

If plant poisoning suspected, samples of suspected plant (14).

Pieces of any organs showing abnormalities for *histological* examination (12), and larger pieces in *formalin* (12).

If *prussic acid* poisoning is suspected, 1 per cent. *solution* of *mercuric chloride* should be added to separate samples of *rumen* and abomasum content and these specimens labelled, " Contains mercuric chloride preservative ".

Advise.—

Describe symptoms as accurately as possible (3).

History and poison suspected.

What evidence that the stock had access to the poisonous material or plant.

Any treatment attempted and result.

Note.—

If it is intended to take legal proceedings on the result of laboratory tests in cases of suspected malicious poisoning, observe the following procedure :—

Clean the jars in the presence of an Officer of the Law.

Carry out the entire post-mortem examination (4) in the presence of the Officer of the Law.

Label and seal the specimens as soon as they are taken and hand them to the Officer of the Law.

Obtain a certificate from the Officer of the Law, stating that the specimens were taken in clean containers and contained nothing other than that indicated on the label.

44. POOR CONDITION.

Poor condition may result from so many conditions in animals that the laboratory may be unable to assist in finding the cause unless a detailed history is supplied by the man in the field.

The laboratory should be supplied with full details of the pasture or ration and management methods.

Live animals.—

Examine a number of typically affected animals closely (3) and if any other abnormalities are found submit appropriate specimens for that symptom (see Index).

Always include from each animal the following specimens :—

Duplicate *faecal* samples for parasitic examination (42).

Two blood smears (7).

Advise.—

Full details of the pasture or ration and management methods.

How long the animals have been in poor condition.

Whether the condition developed rapidly or gradually.

Dead animals.—

(*a*) Animals that have died following a chronic emaciated condition should be given a detailed post-mortem examination (4), and specimens submitted as for live animals, plus the following :—

Specimens from any abnormal organs as indicated in the Index (58).

Pieces of liver, kidney and heart for *histological* examination (12).

Smears from liver, heart, kidney, ear and bone marrow (8).

Samples of gut content in sterile pipettes or bottles from various levels along the gut (e.g. small intestine, large intestine, rectum).

Place abomasum or stomach in a container. Slit open and cover completely the abomasum and contents with 10 per cent. *formalin.*

Place small intestine in a separate container and treat as for abomasum.

Place large intestine in a separate container and treat as for *abomasum.*

Blood serum sample (6c).

Liver in a clean container, unpreserved, for mineral analysis [35(*a*)].

Three ribs unbroken [35(*b*)].

(*b*) From animals that have died in an emaciated condition following acute illness send specimens as directed for sudden deaths (50).

45. POULTRY DISEASES.

Wherever possible, three live, typically affected birds should be forwarded promptly to the laboratory for post-mortem examination. Dead birds are of very limited use and where possible select birds which are not likely to die before arriving at the laboratory.

In the case of young chicks more affected birds (6-8) may be sent, preferably alive. Cardboard beer cartons are suitable for air transport of affected birds provided some newspaper or straw is placed in the bottom to absorb moisture.

Advise. —

Full details of ration.

Method of management (whether penned or on free range).

Complete history of illness (2 and 3).

Any external parasites found on the bird, in the fowl pen, nests, or under perches. If so, send specimens (41).

46. REPRODUCTIVE DISORDERS.

(*a*) *Discharges from the reproductive tract* (*vagina* of females or *prepuce* of males). Contamination of discharges from the outside may render them unsatisfactory for bacteriological examination unless the specimens are well refrigerated. They should be collected as follows :—

Collect as much discharge as possible from the exterior, into a sterile bottle.

Clean the outside lips or orifice of the *vagina* or *prepuce* with moist swabs.

Introduce a long pipette into the organ as far as possible, after having flamed the broken end of the pipette well, to smooth the end. Collect a sample of the discharge into the pipette. If insufficient discharge is obtained, the organ may be rinsed out with a little sterile normal saline, and some of the washings sucked up into the pipette. Special pipettes for vaginal or preputial washings may be supplied by the laboratory on application, together with directions for their use.

Forward also four smears of the discharge.

Send also a *blood serum* sample (6c).

Both the bottle and pipette should be well refrigerated after collection until sent to the laboratory.

If the animal dies after showing a vaginal discharge, send :—

Pipettes and smears of the *uterus* contents.

Pipettes and smears of the *vagina*.

Rest of the reproductive tract in 10 per cent. *formalin*.

Blood serum sample (6c).

Advise.—

How long the animal has had the discharge.

Is the discharge recurrent or continuous?

If recurrent, does it occur only when the animal is in season?

Nature of the discharge, e.g. watery, thick, purulent, blood stained, foul smelling, profuse or scant.

Breeding history of the animal.—

(*b*) *Abortions and Stillbirths.* See (17).

(*c*) *Infertility.*—

The diagnosis of *infertility* in the individual animal is basically a field problem. The problem of herd infertility is an important one in which the laboratory is most interested. Owners are urged to keep breeding records of their animals wherever possible, as these are the logical starting point for the investigation of the problem. The records should be submitted to the laboratory and from these we may be in a position to organize a field investigation of the cause of herd infertility.

(*d*) Diseases associated with parturition *in females.*—

Female animals may show marked symptoms at the time of giving birth to young or during the early period of lactation. It is important to give a complete description of symptoms in such cases after having examined the sick animal as in Section 3.

Forward the following specimens :—

A *blood serum* sample (6c).

A urine sample, unpreserved (55).

From animals dying from such conditions forward also :—

Pieces of liver for *histological* examination (12).

Rest of liver in 10 per cent. *formalin*.

The reproductive tract as under (*a*).

47. SKIN CONDITIONS.

Live animal.—

Small animals showing *skin lesions* should be forwarded alive, if possible.

If scabs are present, remove with clean forceps and forward in sterile bottle.

Make four blood smears from raw surface under scabs (9).

With forceps, pluck out hairs from edge of lesion and place in a sterile bottle (15B).

Apply glycerin to the edge of the lesion—scrape deeply with a knife until pin-points of blood appear. The scraped material will collect in the glycerin which is then removed and placed in a sterile bottle.

In the case of wool conditions send also pieces of affected wool in a sterile bottle (15B).

If plant *photosensitization* suspected, forward a sample of suspected plant (14).

Dead animal.—

As for live animal plus :—

Pieces of affected skin for *histological* examination (12). These should be pinned out to prevent it from shrinking in *formalin*.

Rest of lesion in 10 per cent. *formalin* (12).

Citrated blood sample (6B).

Pieces of liver for *histological* examination (12).

Thyroid gland if enlarged (25).

Advise.—

Situation of *lesion* on body (illustrate by sketch).

Shape of *lesion* and approximate size (illustrate by sketch).

Whether one or more similar *lesions* are present.

On what part of body first noticed.

When first noticed.

Whether *lesion* extended and if so, rapidly or slowly.

Whether affected parts are only on white haired areas.

Whether overlying hair or wool is discoloured, matted, thinned out or lost.

Whether lesion is moist or dry.

Whether affected skin badly swollen or thickened.

Are ticks, lice or any other skin parasites visible.

48. SPLEEN ABNORMALITIES.

From abnormal spleen tissues forward the following specimens :—

Pipettes of abnormal area (10).

Smears of abnormal area (8).

Pieces of abnormal area for *histological* examination (12).

The rest of the *spleen* in 10 per cent. *formalin* (12).

If *spleen* is enlarged and of the consistency of raspberry jam, send extra smears, and a limb bone for *bacteriological* examination (13).

49. STOMACH AND INTESTINAL DISEASES.

Live animal.—

Collection of faecal sample. Faecal samples must be collected from the *rectum* of the animal and *not* from the droppings on the ground.

Insert the forefinger into the animal's *rectum.*

Irritate the top internal surface of the *anus.*

This will cause the animal to pass *faeces* which are collected as follows :—

From animals suffering from scours, diarrhoea, dysentery, or other sign of stomach or intestinal disorders—

Collect two ounces of *faeces* into a sterile bottle.

Collect as much *faeces* as possible into a second clean container.

Send both unpreserved. The first sample should be kept cool until it reaches the laboratory; the second need not be refrigerated.

Dead animals.—

In animals dying following illness involving diarrhoea, or dysentery or animals showing lesions of the stomach or intestine, at post-mortem examination, send :—

Pipettes (10) and smears (8) of the *mesenteric lymph nodes.*

Pipettes (10), and smears (8) of liver.

One pound of rumen content unpreserved in a clean jar.

One pound of rumen content—squeeze out liquids—place in a clean jar—cover with 10 per cent. *formalin.* This should include samples of any suspicious plant material found in searching the rumen content.

Three samples of small intestine content. One from near each end, and one from about the middle, collected as follows—

Cut out a length of the small intestine at the three situations.

Run the contents into sterile bottles (3 to 4 oz.) forcing it out with the forefinger and thumb. The bottles should only be half filled.

Indicate on the bottles, the site from which the contents were taken.

Do not add formalin. If available, five drops of chloroform may be added to each bottle.

Make also smears (9) from the mucous membrane of each section of the bowel from which the gut content was collected.

Place the abomasum or stomach in a clean container. Remove half the contents and place in a separate jar and forward unpreserved. Slit open the abomasum or stomach and cover completely the organ and the rest of the content with 10 per cent. *formalin.*

Place the small intestine in a container and treat as for the abomasum.

Place the large intestine in a container and treat as for abomasum.

Send also—

Liver for mineral analysis [35(*a*)].

Two limb bones for bacteriological examination (13) and appropriate specimens from any other abnormal organ (see Index 58).

Advise.—

How long the animal had shown intestinal symptoms before the specimens were taken.

Particular attention should be paid to supplying full details of advice as requested in Sections 2 and 3.

50. SUDDEN DEATHS.

Before proceeding with the examination of the dead animal (4) inspect the body closely for any indications of skin discolouration (47), discharges from the eyes (23), nose (39) or anus (49), diarrhoea

(49), swellings (51) or wounds (56). If any of these abnormalities should be present make sure that appropriate specimens are included.

It is particularly important to note the position of the animal or any disturbance of the ground as an indication of possible violent death.

Specimens from several animals are desirable, if possible.

Always include the following specimens, whether they show any obvious port-mortem abnormalities or not :—

Two limb bones for bacteriological examination (13).

Six blood smears (7), taken from either the ear vein or a vein in the leg.

A *blood serum* sample (6c).

From the spleen—pipettes (10), and smears (8).

From the heart—smears (8) of muscle and pipette (10) of blood, rest of the heart in 10 per cent. formalin.

From one kidney—pipettes (10), smears (8), and tissues for *histological examination* (12), rest of this kidney in 10 per cent. *formalin.*

The other kidney, unpreserved, in a clean jar.

From the liver—pipette (10), smears (8), tissues for *histological* examination (12), about half the liver, unpreserved, in a clean jar, and the rest of the liver in 10 per cent. *formalin.*

One pound of *rumen* content unpreserved in a clean jar.

One pound of *rumen content*—squeeze out liquids—place in a clean jar, and cover with 10 per cent. *formalin.*

This should include samples of any suspicious plant material found in searching the *rumen* content.

Three samples of small intestinal content.

One from near each end, and one from about the middle, collected as follows—

Cut the small intestine at the three situations.

Run the contents into sterile bottles (3 to 4 oz.) forcing it out with the forefinger and thumb. The bottles should only be half filled.

Indicate on the bottles the site from which the contents were taken.

Do not add formalin. If available five drops of chloroform may be added to each bottle.

Make also smears (9) from the mucous membrane of each section of the bowel from which the gut content was collected.

Place the abomasum or stomach in a clean container. Remove half the contents and place in a separate jar and forward unpreserved. Slit open the abomasum or stomach and cover completely the organ and the rest of the content with 10 per cent. *formalin.*

Place the small intestine in a container and treat as for the abomasum.

Place the large intestine in a container and treat as for the abomasum.

Advise.—

Full description of all post-mortem findings.

Full description of any symptoms if the animal was seen before death.

Observe the rest of the herd for sick animals.

Give these a complete clinical examination (3), and forward appropriate specimens if any abnormalities are found.

51. SWELLINGS.

Generalized swellings of the abdomen or swellings suspected of being ruptures or swollen joints (29), should not be opened except by persons who are thoroughly familiar with the necessary surgical procedures. Ruptures should be suspected if the swelling is on the lower surface of the abdomen just in front of or between the hind legs. The contents of the rupture may frequently be manipulated back into the abdomen.

Swellings suspected of containing fluid may be treated as follows :—

Clean overlying skin with methylated spirit.

Allow spirit to dry.

Aspirate fluid with sterile syringe (15B).

Place aspirated fluid in sterile bottle (15B).

Make three smears from the fluid (9).

If it is decided to incise the swelling, proceed as follows :—

Clip overlying hair if necessary.

Clean surrounding skin with swabs of methylated spirit.

Allow spirit to dry.

Make a bold incision with a sharp, sterile knife [15(*b*)].

Examine the contents of the swelling.

If fluid, collect into pipettes (10) or sterile bottles.

If firm, remove some for *histological* examination (12).

Make four smears (8) from cut surface.

Advise.—

Size of swelling.

Location on body.

Consistency—hard, soft, oedematous, firm, fluid or gaseous.

Movable or firmly attached to underlying tissues.

Does overlying skin show any abnormalities, e.g. discolouration, moistness, loss of hair or ulceration (47).

Whether one or many swellings on body.

Appearance of cut surface.

52. TICK FEVER.

Tick fever is most likely to occur in animals recently (2-3 weeks) removed from a non-infected (clean) area to a tick-infested area.

If tick fever suspected send the following specimens :—

Live animal. —

Six blood smears (7) taken from animals showing marked symptoms of fever (24).

Dead animals.—

Two smears from each of the following organs :—

Kidney, heart, liver, spleen and ear vein (7).

A limb bone for bacteriological examination (13), in case examination for other conditions is necessary.

Advise.—

Any contact with other stock or movements on to the property within the previous six weeks.

Complete description of symptoms.

Record temperatures.

53. TUBERCULOSIS.

Live animals.—

The disease may be diagnosed by the tuberculin test. Owners may contact the Department to arrange for such tests to be carried out.

Dead animals.—

Lesions suspected of being tuberculous should be treated as follows :—

Take pipettes (10) from *lesions*, or place part of *lesion* in sterile bottle.

Make smears from pus (9).

Cut out pieces for *histological* examination (12).

Place rest of *lesion* in 10 per cent. *formalin.*

Keep pipettes or sterile bottles well refrigerated (5) until forwarding.

Adivse.—

Whether *lesion* was found in body.

Whether other *lesions* were found.

Appearance, colour and consistency of pus.

54. UDDER AND MILK ABNORMALITIES.

Live animals showing any obvious abnormality of milk or udder, send a milk sample (11) from each quarter.

Dead animal.—

At post-mortem examinations where udder *lesions* are found send the following specimens :—

Pipettes of udder *lesion* (10).

Smears of udder *lesion* (8).

Parts of udder *lesion* for *histological* examination (12).

Rest of udder in 10 per cent. *formalin.*

Milk samples (11).

Examine also the *supramammary lymph node* and if abnormal forward appropriate specimens (34).

Advise.—

Appearance of milk when first drawn.

How long the animal has shown milk or udder abnormality.

Appearance and feel of udder.

Temperature of affected animal.

Whether affected animal has been treated before specimens taken.

55. URINE ABNORMALITIES.

Live animals.—

Collection.—The ideal urine sample for the laboratory examination is one taken with a sterile catheter, but in most instances this will not be possible in the field. Samples may be collected during the animal's natural voiding of urine. If the animal is stalled or yarded a boy may be left with it to collect urine as it is passed. The attachment of a long handle to a clean jar facilitates the collection from standing animals. Many animals (especially cattle, sheep and goats), will urinate as they stand up after being disturbed at rest. Horses may urinate after being worked. Sheep and goats may be made to urinate by holding the hand over their nostrils until the animal begins to struggle with excitement. It will urinate soon after release. Stroking the perineum with a wisp of straw or grass will encourage some animals to urinate.

Specimens required.—

One ounce in a sterile bottle. Add six drops of full strength formalin (*not* 10 *per cent.*) per ounce of urine.

One ounce in a sterile bottle.

Both specimens should be held in a refrigerator until forwarding.

From animals showing red or dark discolouration of urine, send also :—

Three blood smears (7).

Dead animals.—

Collection.—The urine is best collected after opening the abdomen, by :—

Piercing the bladder with a sterile pipette and withdrawing urine; or

Piercing the bladder with a wide bore hypodermic needle and allowing the urine to flow into a sterile bottle, preserving as for live animal.

Specimens required.—

Pipettes (10) or sterile bottles of urine.

Smears of internal surface of the bladder (9).

Pieces of bladder for *histological* examination (12).

Rest of bladder in 10 per cent. *formalin.*

Smears (8) of kidney, liver and heart.

Pieces of kidney for *histological* examination (12).

Both kidneys in 10 per cent. *formalin.*

If *Urinary Calculi* (stones) are found in the kidney or bladder at post-mortem examination send also :—

Stones unpreserved in a clean jar.

Advise.—

Age of affected animal.

The following characteristics of freshly collected urine :—

Colour (clear, amber, cloudy, red, dark).

Presence of any blood or mucus.

Odour.

If act of urination abnormal, describe.

56. WOUNDS.

No laboratory assistance need be required in the case of wounds undergoing satisfactory healing with normal treatment.

(*a*) If wounds fail to respond :—

Collect pipettes (10) from the deeper parts of the wound. Samples of the surface layer are useless.

(*b*) If the nearby *lymph node* is enlarged, contents should be withdrawn with a sterile syringe (34), and the aspirated material forwarded in a sterile bottle.

(*c*) If excessive *granulation tissue* (proud flesh) is present, send small pieces for *histological* examination (12).

(*d*) From wounds infected with screw worm larvae send :—

Larvae as in Section 41.

Live larvae (41).

(*e*) If wounds are accompanied by generalized illness or nervous symptoms.

Describe symptoms.

Record temperature.

If surrounding tissues are swollen incise and collect pipettes as under swellings (51).

(*f*) From animals dead from infected wounds send :—

Two limb bones for bacteriological examination.

Pipettes of tissues and fluids surrounding the wound (10).

Specimens from *lymph nodes* (34) which drain the area of the wound.

Advise.—

How the wound was received.

A complete description of the symptoms, *lesions* and course of the disease.

Details of any treatment attempted.

57. *Glossary.*

Adhesions : The uniting or growing together of structures or organs which are normally separate and freely movable, e.g. lung and chest wall.

Adrenals : Two small glands one of which is situated just in front of each kidney. They are reddish-brown in colour and on cross-section show two definite concentric zones.

Alcohol-glycerin : This is used as a preservative for parasites in the following mixture—

70 per cent. alcohol—9 parts.
Glycerin—1 part.

Anus : The opening through which unused food material (faeces) is evacuated from the gut.

Bloat : Distension of the abdomen with gas collected in the gut.

Boracic Acid Bottles : Are sterile as supplied by the laboratory and contain a pinch of Boracic Acid. They should be only half filled.

Cannon Bone : The bone between the hock and fetlock of the hind limb or the knee and fetlock of the fore limb.

Cerebrospinal Fluid : The fluid of the brain and spinal cord.

Citrated Blood : Blood to which Sodium Citrate has been added to prevent clotting (see also Sodium Citrate).

Coronet : The sensitive tissue running around the foot of hoofed animals immediately above the hoof.

Cotyledons : The corrugated bowl-shaped organs found scattered over the placenta (afterbirth) of ruminants.

Diaphragm : The muscular partition between the thoracic and abdominal cavities.

Faeces : The dung or manure. The unused food wastes which are evacuated from the gut.

Femur : The bone between the hip and stifle joints of the hind limb.

Fibrin : A clotting substance which forms in shed blood and other body fluids. It occurs in the form of tiny, fine threads. Fibrin deposits give an otherwise smooth internal surface, a roughened feel. Deposits on two neighbouring organs may develop into adhesions (q.v.).

Foetus : A young animal while it is still in the uterus or one which has been expelled prematurely.

Fore stomachs : The first three " stomachs " of ruminants (q.v). They are named respectively, the rumen or " paunch ", reticulum or " honeycomb ", and omasum or " bible ".

Formalin : A chemical used for the preservation of animal tissues. It is supplied by the laboratory or by a chemist as " commercial formalin ". It is diluted for use as follows :—

10 per cent. formalin :—
Commercial formalin—1 part.
Water—9 parts.

5 per cent. formalin :—
Commercial formalin—1 part.
Water—19 parts.

Formol Saline : For preservation of parasites may be made as follows :—

15 per cent. :—
Table salt—18 grams.
Commercial formalin—150 c.c.
Water—850 c.c.

7½ per cent. :—
Table salt—9 grams.
Commercial formalin—75 c.c.
Water—925 c.c.

Gambrel : A bent iron or wooden piece used by butchers to suspend the carcass by the hind legs.

Genital Organs : The sex organs ; the organs of reproduction.

Glycerol-saline : Is supplied by the laboratory in sterile jars. It contains :—

Glycerin—500 mls.
Normal Saline—500 mls.
Acid Potassium Phosphate—2.5 gm.
and is adjusted to pH 7.6.

Goitre : A condition in which the thyroid gland enlarges in size.

Haemorrhage : The escape of blood from blood vessels. Haemorrhages may be seen in various organs under certain disease

conditions in the form of tiny "blood blisters" as small as pinheads or sometimes much larger in size.

Histological Examination : The examination of tissues with the aid of the microscope.

Humerus : The bone of the fore limb between the shoulder and elbow joints.

Infertility : Failure to breed normally.

Jugular Veins : The large veins which carry the blood from the head to the chest. In domestic animals they may be found running down the lower side of the neck, at the side of and slightly above the windpipe (trachea).

Larynx : The "voicebox".

Lesion : Any visible abnormality in an organ or tissue.

Lymph Nodes : Lymph is a fluid which exudes from the blood vessel to bathe the body tissues. It is collected by minute vessels which ultimately return it to the blood stream. Lymph nodes are structures placed along the course of the lymph vessels through which the lymph passes and is "filtered" of foreign substances, e.g. bacterial, cancer cells, etc. They are frequently called lymph glands.

M.F.G. Solution : For preservation of parasites is made as follows :—

Methylated spirit (70 per cent.)—85 parts.

10 per cent Formalin—10 parts.

Commerical Glycerin—5 parts.

Mercuric Chloride : For the preservation of gut content from suspected cases of prussic acid poisoning is made as follows :—

Mercuric Chloride—1 gram.

Water to make—100 c.c.

Nasal Sinuses : Cavities in the substance of the bones of the skull which communicate with the nostrils and contain air. The chief sinuses will be found between the eyes and in the upper jawbone above the roots of the teeth.

Neoplasm : Any abnormal growth, e.g. cancer, tumour, in or on the animal body.

Normal Saline : Solution for use in collection of parasites may be made as follows :—

Table Salt—9 grams.

Distilled Water (or boiled water)—1,000 c.c.

Oesophagus : The gullet. The tube which conveys food from the mouth to the stomach.

Oral Cavity : The cavity of the mouth.

Pancreas : The "sweetbread". A large gland lying in the abdomen between the stomach and kidneys. Part of the gland may be seen attached to the first part of the small intestine, just after it leaves the stomach.

Parturition : The act of giving birth to young.

Penis : The male organ of sexual intercourse.

Peritoneum : The membranes lining the abdominal cavity and covering all abdominal organs.

Peritoneal Fluid : A fluid secreted by the peritoneum which serves to lubricate the movements of the gut and other abdominal organs within the abdominal cavity. It is normally present only in sufficient quantity to keep the peritoneum moist. Any visible fluid should be regarded as excess.

Phenothiazine : Is used for the preservation of faecal samples, and is the same as that used for drenching of domestic animals for the treatment of worm parasites.

Photosensitization : The skin of animals may become very sensitive to sunlight after they have eaten certain plants. This condition may be suspected if a very severe form of "sunburn" develops on the nose, ears, back or udder, especially on white haired areas of the animal.

Prepuce : The sheath of loose skin covering the end of the penis in male animals.

Prussic Acid : Cyanide or Hydrocyanic Acid. Commonly occurs in certain plants (sorghum, wild passion, and many others) and may cause sudden deaths in animals eating such plants.

Putrefaction : The decomposition of the dead animal body which is accompanied by foul odours.

Radius : The large bone of the fore limb between the elbow and knee joint.

Rectum : The terminal part of the bowel.

Rigor Mortis : The stiffness of the body that occurs after death.

Rumen : The paunch or first stomach of ruminants (q.v.).

Ruminants : Animals which chew the cud and have a rumen (e.g. cattle, sheep, goats, deer and buffalo).

Ruptured : Broken or burst open.

Scours : Excessively soft or liquid faeces.

Scrotum : The pouch of skin in which the testicles are lodged.

Serum : The fluid that separates from blood and certain other body fluids when they clot.

Sodium Citrate : A chemical used to prevent clotting of blood. As supplied by the laboratory it is made as follows :—

Sodium Citrate—10 grams.

Water to make—100 mls.

To prevent coagulation mix 1 part of Sodium Citrate with 9 parts of blood. Bottles as supplied containing solid Sodium Citrate should be three-quarters filled.

Spleen : The large plum-coloured organ attached to the stomach or rumen. It is of variable consistency—sometimes being large and soft, and engorged with blood, at other times being shrunken, paler and leatherlike.

Subcutaneous tissue : The loose connective tissue lying between the skin and muscles or other underlying carcass structure.

Thyroid Gland : A reddish-brown coloured organ lying in the throat. It consists of two bodies lying on either side of the larynx (q.v.) joined across the under side of the larynx by a narrow connecting piece or " isthmus ".

Thoracic Cavity : The cavity of the chest.

Tibia : The larger bone of the hind limb between the stifle and hock joints.

Trachea : The " windpipe ".

Tumours : Sometimes refers to any swelling but often restricted in use to refer to a neoplasm (q.v.) or new-growth.

Ulcer : A slow-healing crater-like lesion of the skin or other tissue.

Upper Respiratory Tract : Those organs of respiration (breathing) lodged in the head and neck. Includes the nose, nasal sinuses, larynx and trachea (q.v.).

Uterus : The womb. The structure in the female that receives and nourishes the foetus (q.v.).

Vagina : The female organ of sexual intercourse.

Vulva : The external parts of the vagina.

58. *Index*

For the convenience of persons trained in the recognition of animal diseases, this Index includes the names of many specific diseases as well as the simpler headings used in the text. The reference number for these specific diseases indicates the set of specimens to be forwarded to the laboratory. Untrained persons should use the headings referring to the symptoms or affected organs, rather than attempt to guess the specific disease. All persons should ensure that each symptom or affected organ is dealt with as suggested in the text.

Appendix 1.

Suggested equipment for persons wishing to use Veterinary Laboratory diagnostic facilities.

A. *The following equipment prepared and supplied by the laboratory on request* :—

Book of specimen advice notes.
Sterile bottles, 1 oz.
Sterile bottles, 1 oz., containing sodium citrate.
Sterile bottles, 1 oz., containing boracic acid.
Sterile jars, 4 oz.
Sterile jars, 4 oz., containing glycerol-saline.
Sterile pipettes.
Flat padded tins, for forwarding pipettes.

B. *The following equipment obtainable through your chemist or station agent* :—

Alcohol-glycerin mixture (See Glossary).
Cotton wool non-absorbent.
Foreceps, bone.
Forceps, dissecting.
Forceps, artery, 7 in., Spencer Wells type.
Formalin, commercial.
Gloves, rubber.
Grease pencil (chinagraph) or other glass marking pencil.
M.F.G. Solution (See Glossary).
Needles, typodermic, Record fitting, 3 in., gauge 14.
Needles, hypodermic, Record fitting, 3 in., gauge 18.
Needles, hypodermic, Record fitting, 1½ in., gauge 20.
Needles, surgical suture, straight.
Scalpel handle, Bade Parker type, size 4.
Scalpel blades, Bade Parker type, size 22.
Scissors, straight, blunt pointed, 8 inch.
Slides, microscope, 3 in. x 1 in., ground edges.
Syringe, hypodermic, 20 c.c., Record type.
Teats, rubber (eye dropper type).
Thermometers, clinical.
Thermos flask, wide mouth.

C. *The following items of general household or station use* :—

Notebook and pencil.
Butcher's knives.
Butcher's steel.
Bon Ami.
Bucket.
Cardboard for cutting inner lids for jars.
Cork for holding ear prick needle.
Disinfectant.
Gambrel.
Jars, assorted, clean, screw capped.
Jars, large, clean, with bakelite lid.
Lysol.
Meat chopper, bush knife or axe.
Methylated spirit.
Painter's blow lamp.
Paper and glue for labels.
Pressure cooker.
Razor.
Refrigerator.
Saw.
Scotch tape.
Spatula or old table knife.
String.
Towels or other clean, dry cloths.
Suitable cartons or boxes.
Sawdust, wood waste, or other packing materials.
Suitable means for restraint of animals (e.g. crush or milking bail, ropes and halters for large animals, nose twitch for horses, rope nose loop for pigs).

Appendix 2.

Field Investigation of Animal Diseases.

If you desire that your property be visited by a Government Veterinary Officer, for the purpose of investigating illness or a husbandry problem in your livestock, address your application to :—

Chief of Division of Animal Industry,
Department of Agriculture, Stock and Fisheries,
Port Moresby,
or
to your District Veterinary Officer.

Give all details of illness as listed in Section 2.

Submit any specimens and advice which may assist in a preliminary laboratory investigation of the condition. This may save valuable time by allowing the Veterinary Officer to make special preparations for the laboratory investigation.

It is assumed that you will—

(*a*) muster all animals for inspection and provide adequate assistance in the handling of animals ;

(*b*) be willing to have any animals on the property submitted to any tests that the Veterinary Officer considers necessary including skin tests, blood tests, and operative procedures necessary for the collection of specimens;

(*c*) if necessary have a typically affected animal destroyed for post-mortem examination ;

(*d*) have adequate facilities for the restraint and examination of animals. For cattle this should include yards and crush or milking bail, ropes and halters ; and

(*e*) If necessary arrange suitable means of transport for the Veterinary Officer to your property.

If you are unable to comply with any of these conditions, mention them in your letter.

Acknowledgments.

Sections 41 and 42 were contributed by Dr. W. J. Szuggar. Other helpful suggestions were made by Messrs. G. C. Simmons, J. Marley, A. Charles and Mrs. P. Webster.

Rural Broadcast—

MECHANIZED RICE PRODUCTION IN PAPUA AND NEW GUINEA

Considerable progress has been made in the Territory in the last two years, by growers, who are interested in the mechanized production of rice, and there are signs that the industry is becoming firmly established in at least two areas, the Markham Valley and the Mekeo. This talk aims to briefly review the methods recommended for growers at the present time, and some of the problems associated with the developing industry. All references are to the dry system of production, since favourable conditions for irrigation have not yet been located in accessible areas.

The first phase in the development of a rice growing area, is the initial land preparation. Because of the clearing cost factor, grasslands are virtually the only type of country being opened up for rice farming on a mechanized scale. These in their natural condition are found to have a dense cover of a coarse fibrous grass, either of the shorter types such as kunai or the taller types such as cane-grass. The above-ground part of this cover must be removed to permit the use of agricultural implements on the land and burning is recommended. Growers should avoid the high costs of uncontrolled burning or of slashing by hand to promote a burn. The best technique is to mechanically roll the grass flat on the area to be cultivated, and then burn after a period of a week or so for drying out of the broken stalks. This will be found to give a very uniform burn. Suitable rollers for towing behind a tractor can be cheaply improvised by welding strips of angle iron or steel rails on to 44-gallon drums, or by setting spikes in a hardwood log selected for its cylindrical shape.

On completion of the preliminary burning, the land will be found to be carrying a heavy content of grass stalks and roots, and this must be reduced by ploughing. Disc ploughs are recommended and the heavy bodied types should be used if possible. Heavy ploughs built on the spring-controlled disc principle such as the Australian "Majestic" plough, have done the best work in the Department of Agriculture trials. Ploughs should be set to work deep enough to ensure that all grass roots are taken and turned up towards the surface, where they can be chopped up by further tillage operations.

Initial ploughing should be followed by cross-ploughing and several cultivations with conventional tillage implement such as disc harrows. The aim of these operations is, two-fold—both to kill out the native coarse grasses, and to promote the digestion in the soil of the great bulk of fibre left behind by their roots and stalks. This initial work should always be done at least six months and preferably nine monthe before the sowing of the first crop, otherwise this crop will be a very disappointing one, varying from patches which have run to too much stalk and leaf, to patches which are stunted and low yielding, and will inevitably be heavily infested with native grasses. An alternative, is to grow a heavy-feeding smothering crop, such as sweet potato immediately after the land is first opened up.

These opening up operations, are the most expensive phase in the development of rice farming, and growers should plan them very carefully and give careful thought to the purchase of the necessary implements. Conventional disc ploughs, which on present experience are essential for the control of native grasses, are slow-moving with a comparatively narrow cut. As will be mentioned later, it is considered, that on properly managed land, the use of such ploughs will be necessary only once every three or four years. Ideally, therefore, groups of growers should combine to split the cost of such equipment.

Fig. 1.—An almost pure stand of cane-grass ("Saccharum" sp.) in the Mekeo area, typical of the grass cover found on many areas of river valley and plain-country soil prior to cultivation.
(Photo by courtesy of K. R. Ewart)

Fig. 2.—Regrowth of cane-grass after single deep ploughing of virgin grassland.
(Photo by courtesy of K. R. Ewart)

Fig. 3.—Fallowed rice land.
(Photo by courtesy of K. R. Ewart)

Fig. 4.—Harvesting a partially lodged rice crop in the Mekeo area using an open-front header.
(Photo by courtesy of S. C. Baseden)

Rice needs a carefully prepared seed-bed, and should never be sown into land where weeds have already germinated. In such cases, an extra harrowing should always be given. Conventional types of multi-row grain combines have proved quite satisfactory for seeding in this Territory, and ensure the most effective use of prime-movers. Disc-drills are to be preferred to hoe-drills.

Much has recently been learned concerning suitable harvesting procedures, for rice, in the Territory. The importation and trial of the open-front type of header, has shown that this machine is definitely superior to types which feed the headed crop in through a winder. The open-front type machines are much better adapted to handling the heavy leaf and stalk growth of our crops. Additional equipment, such as the pick-up reel fitted with fine steel fingers, and similar picking-up fingers used on the elevator canvases is most valuable in the harvesting of fallen crops.

Growers in selecting seed, should look ahead to harvest time, when for mechanical harvesting even ripening is of great importance. The sowing of a mixture of varieties or of a variety known to ripen unevenly, should be avoided. Where a crop is ripening unevenly, as sometimes occurs, during unseasonal weather, regardless of the variety used, a mechanical windrower can be helpful. This machine mows the crop and delivers it in orderly rows across the field. The crop is allowed to ripen, in these windrows, and is then harvested by an open-front header with pick-up attachments.

Tillage between crops aimed at giving controlled management of the area being farmed, is considered to be of the utmost importance. The practice of leaving land untouched between crops, leads to the re-establishment of native grasses and the costly use of the plough before a new crop can be safely sown. Tillage implements such as disc harrows and disc tillers, are fast moving with far wider cuts than ploughs of the same draft and very economical to operate. The aim in using them should not be to maintain a bare surface during the inter-crop period, but to reduce all volunteer growth at sufficiently frequent periods to prevent the native grasses from getting established. Some breaking up of the sub-surface soil to provide for aerating and drainage is desirable prior to the sowing of each new season's crop. This can be done effectively and economically using the new sub-surface tillage type of equipment such as chisel cultivators and sub-surface sweeps.

Careful use of the tillage implements mentioned above should enable the grower to eliminate ploughing until such time as the land has to be left out of crop for the inevitable rest period.

This brings us to the close of the present talk.

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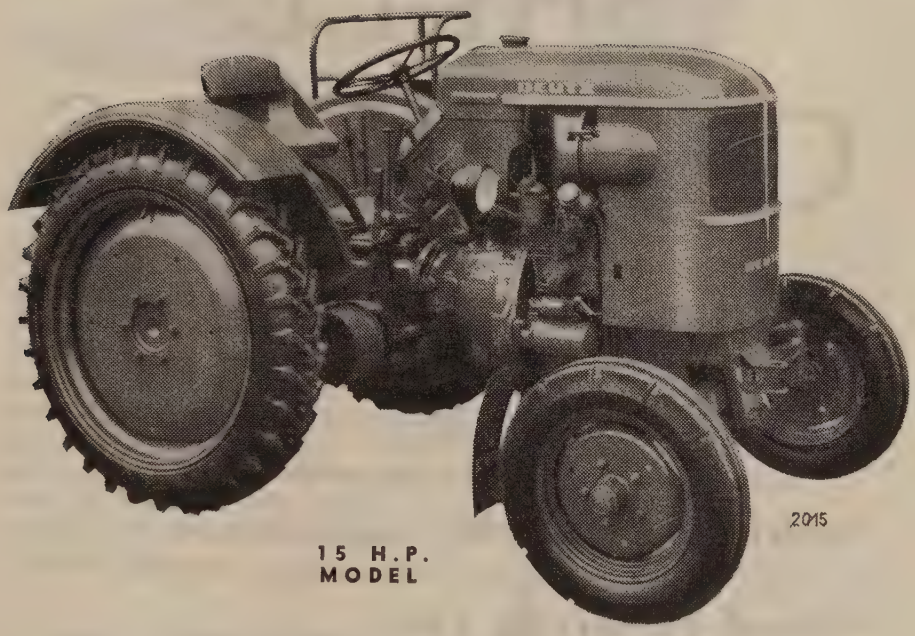

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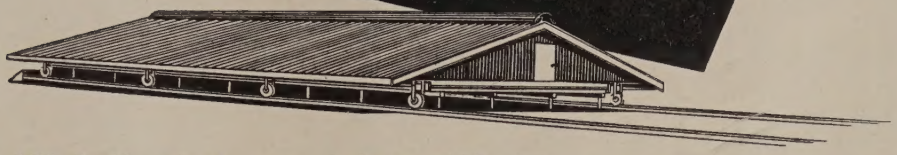

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